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-104A02-DU2511-G010
APPROVED BY	
DATE	

☐ Preliminary Specification
☑ Formal Specification

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*This specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2023/08/16	-	New Release	Tank

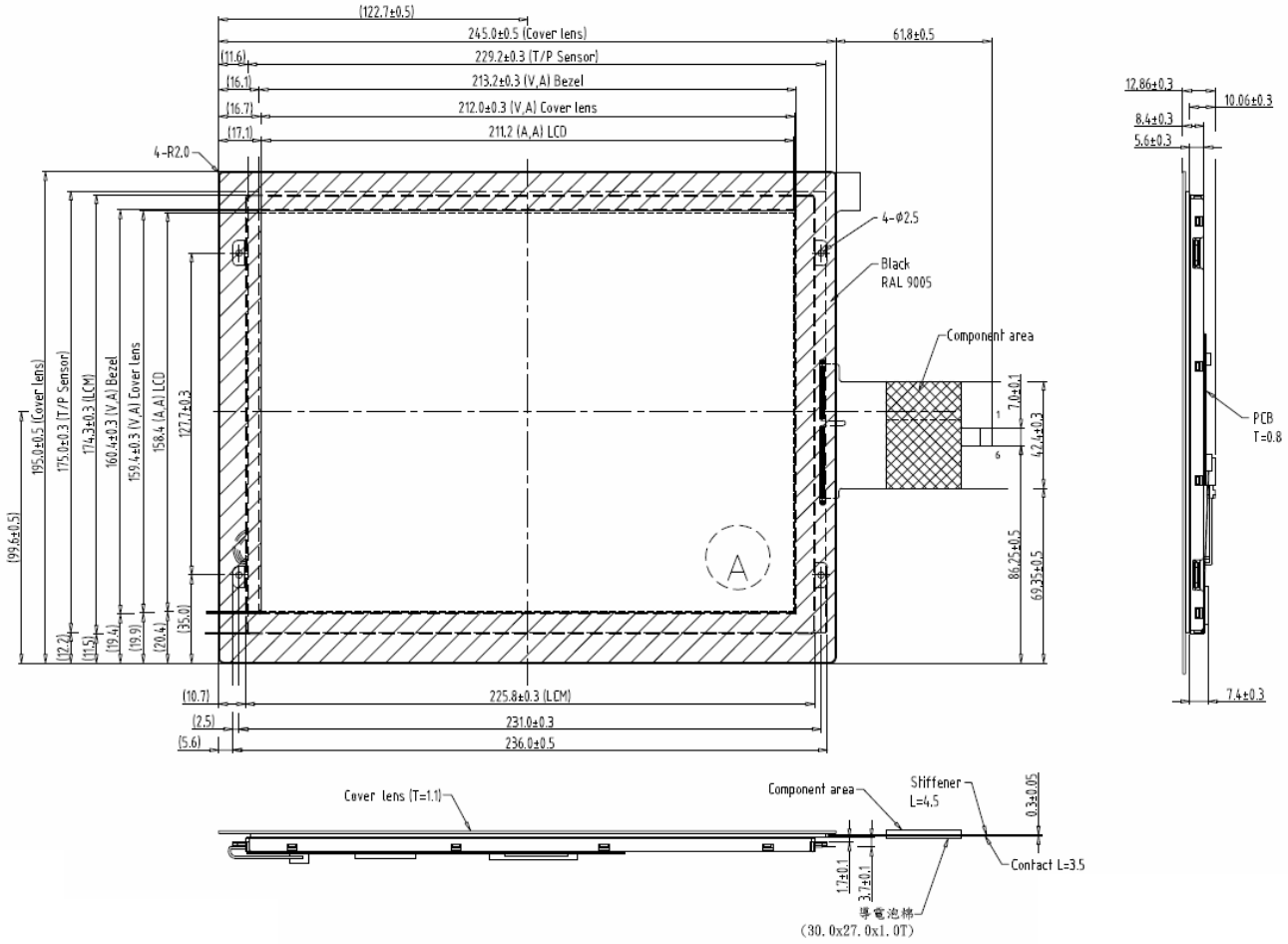
1. General specification

This is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 10.4 inch diagonally measured active display area with HD (1024 horizontal by 768 vertical pixels) resolution.

(1) Construction : 10.4” a-Si TFT active matrix, White LED Backlight.
(2) Resolution (pixel) : 1024(R.G.B.) x 768
(3) Number of the Colors : 16.2M (R , G , B 8 bit digital each)
(4) LCD type : Normally black
(5) Interface : 20PIN LVDS (With LED Driver)
(6) ROHS compliant
(7) Projective Capacitive Touch
    a. Interface : USB
    b. IC Controller : ILI2511
    c. Cover Lens: Tempered Soda Lime Glass (245.0 x 195.0 x 1.1mmT)
        i. Printing : Black border (Pantone : Black)
        ii. Surface Treatment: None

1.1 Display Characteristics

Item		Specification	Unit
Outline Dimension		245.0 (H) x 195.0 (V) x 12.86 (D)	mm
Display Area		211.2(H) x 158.4(V) (10.4” diagonal)	mm
Number of Pixel		1024(H) x 768(V)	pixels
Pixel Pitch		0.20625(H) x 0.20625(V)	mm
Pixel Arrangement		RGB Vertical Stripe	
Display Mode		Normally Black	
Back-light		Single LED (Side-Light type)	
Power Consumption	Logic System (White Pattern)	TBD(max) @VDVDD=3.3V	W
	B/L System	TBD	W



2. Optical Characteristics

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)		Y_L		1020	1275	--	cd/m^2	(1)(4) (I_L=370mA)
Color chromaticity (CIE1931)	White	W_X		Typ. -0.05	0.313	Typ. +0.05		(1)(4)
		W_y			0.329			
	Red	R_X			0.667			
		R_y			0.326			
	Green	G_X			0.274			
		G_y			0.597			
	Blue	B_X			0.134			
		B_y			0.115			
Viewing Angle	Hor.	$Θ_L$	CR>10	80	85			
		$Θ_R$		80	85			
	Ver.	$Θ_U$		80	85			
		$Θ_D$		80	85			
Brightness uniformity		B_{UNI}	Θ=0	70	80		%	(5)
Optima View Direction		Free						(6)

Measuring Condition

■ Measuring surrounding dark room

■ LED current I_L= 370mA

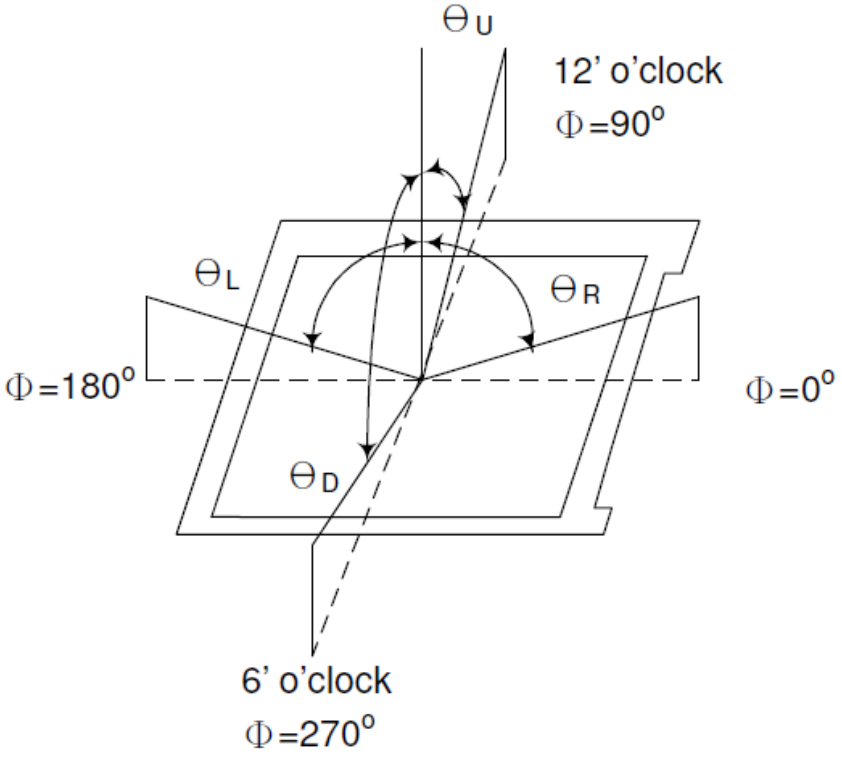
■ Ambient temperature 25±2°C

■ 15min. warm-up time.

Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size : 20 ~ 21 mm

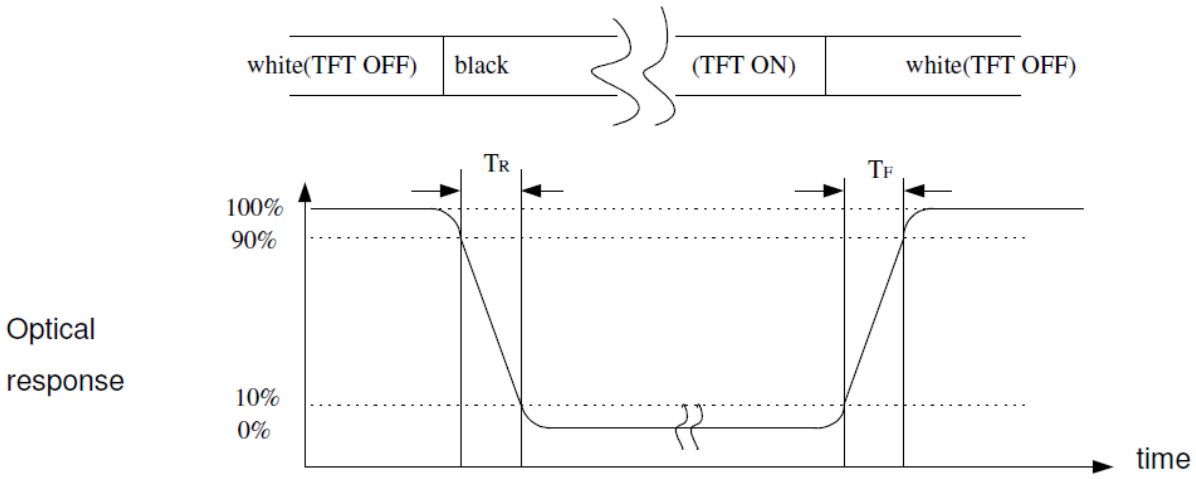
Note (1) Definition of Viewing Angle:



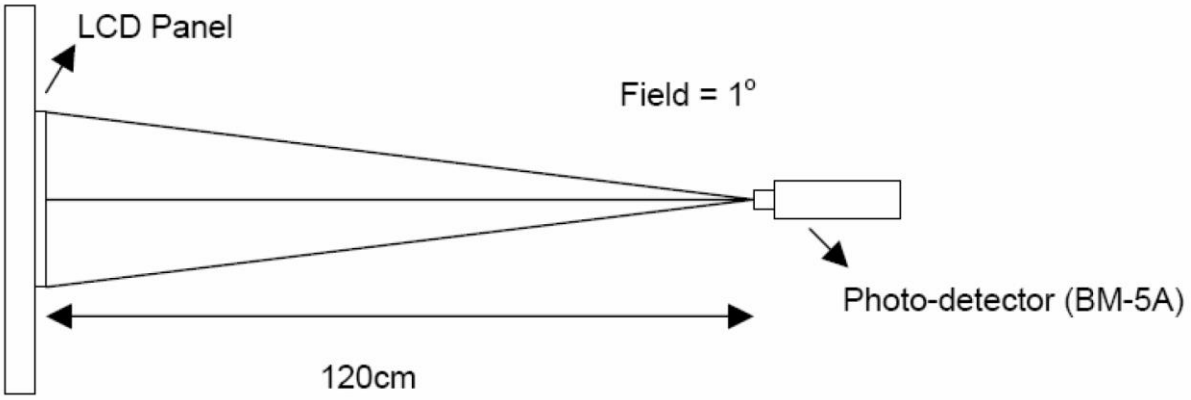
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

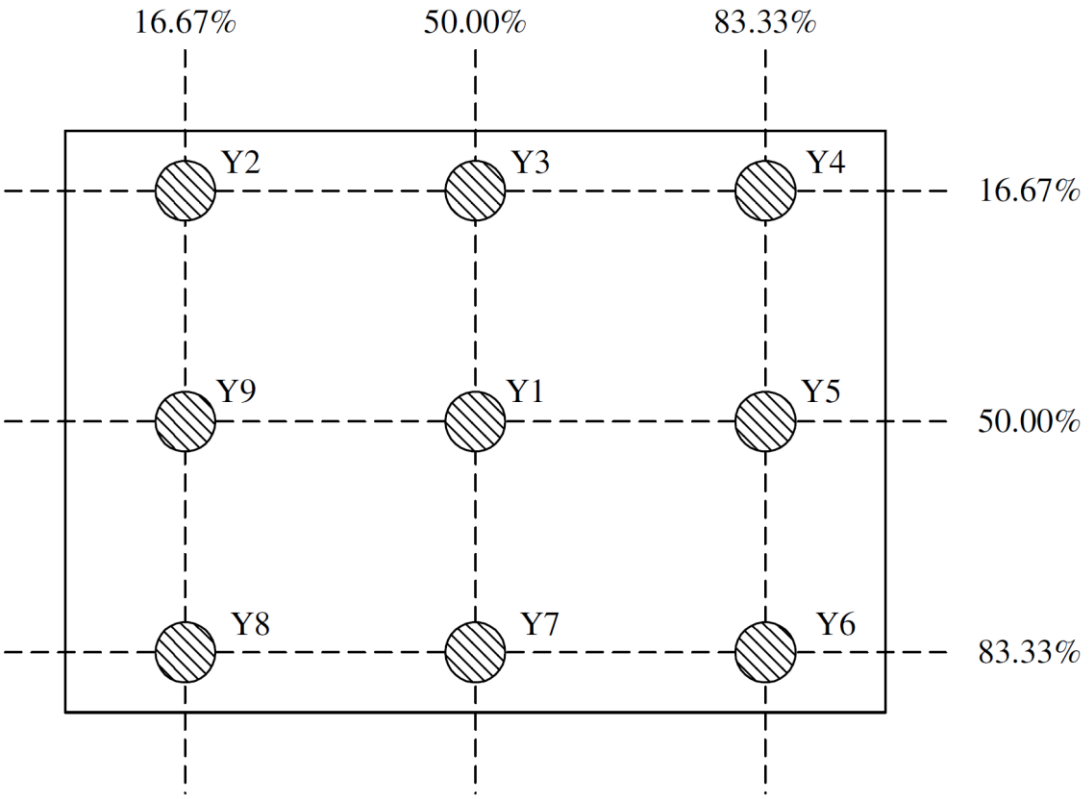
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



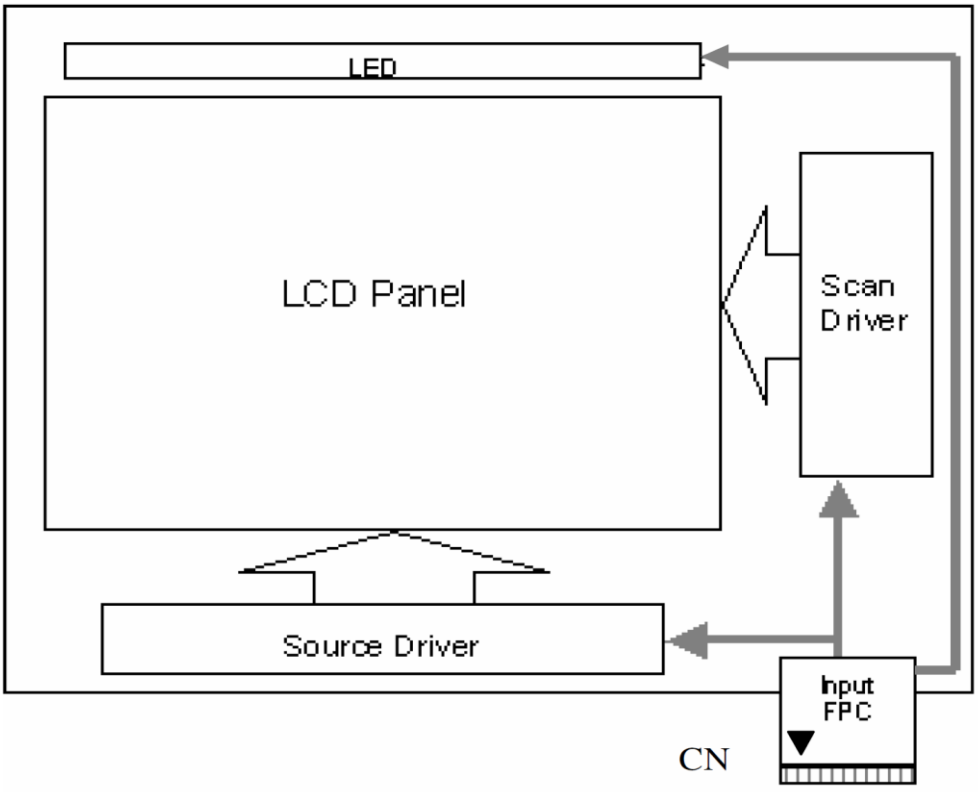
Note (5) Definition of brightness uniformity



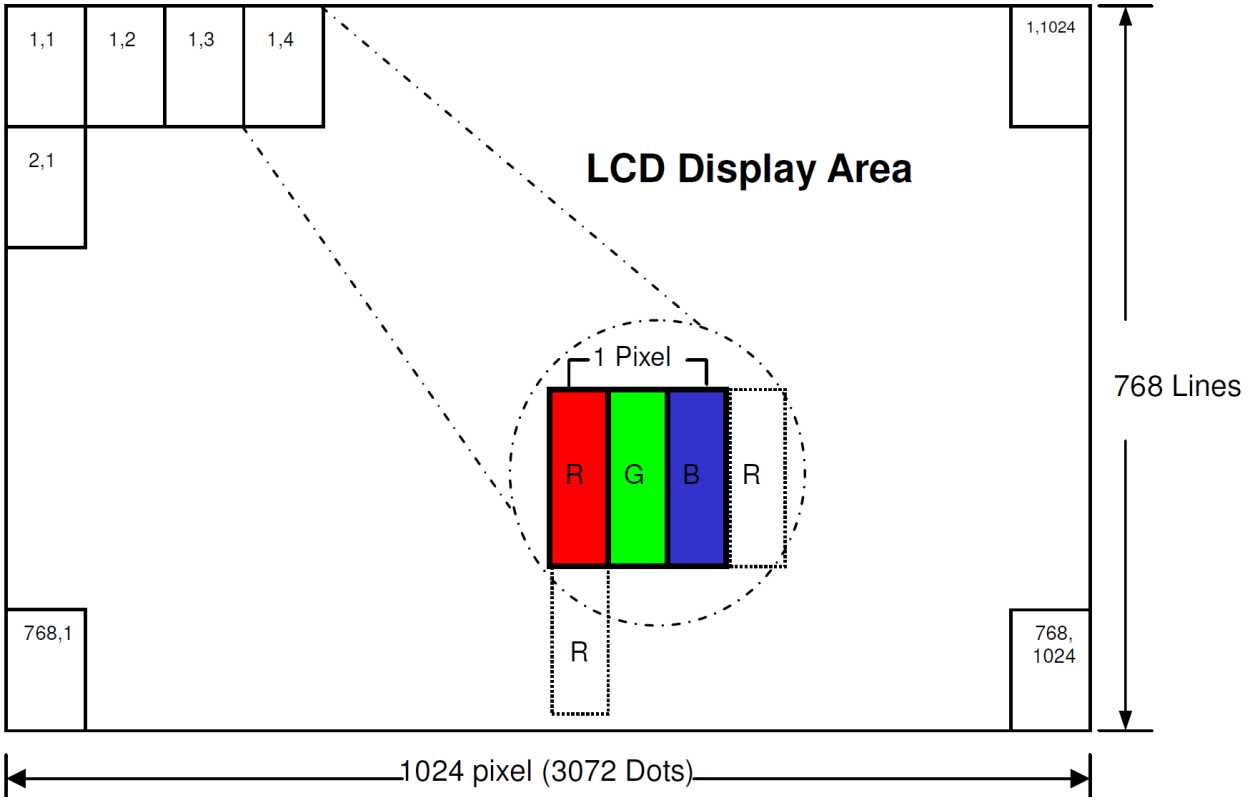
$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

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

3. Functional Block Diagram



Pixel Format



3.1 Relationship between Displayed Color and Input

	Display	MSB R7	R6	R5	R4	R3	R2	R1	LSB R0	MSB G7	G6	G5	G4	G3	G2	G1	LSB G0	MSB B7	B6	B5	B4	B3	B2	B1	LSB B0	Gray scale Level
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
	↑	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
	↑	:								:								:								L3···L251
	↓	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
	Light	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1
	↑	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L2
	↑	:								:								:								L3···L251
	↓	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252
	Light	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L254
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
	↑	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
	↑	:								:								:								L3···L251
	↓	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L252
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L254
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L1
	↑	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L2
	↑	:								:								:								L3···L251
	↓	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	L252
	Light	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	L253
		H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	L254
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255

4. ABSOLUTE MAXIMUM RATINGS

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	5	V	
Logic Signal Input Level	V_{DVDD} V_{DVDD_LVDS}	-0.3	5	V	

4.2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-20	70	℃	
Storage Temperature	T_{stg}	-30	80	℃	

5. ELECTRICAL CHARACTERISTICS

5.1 TFT LCD Module

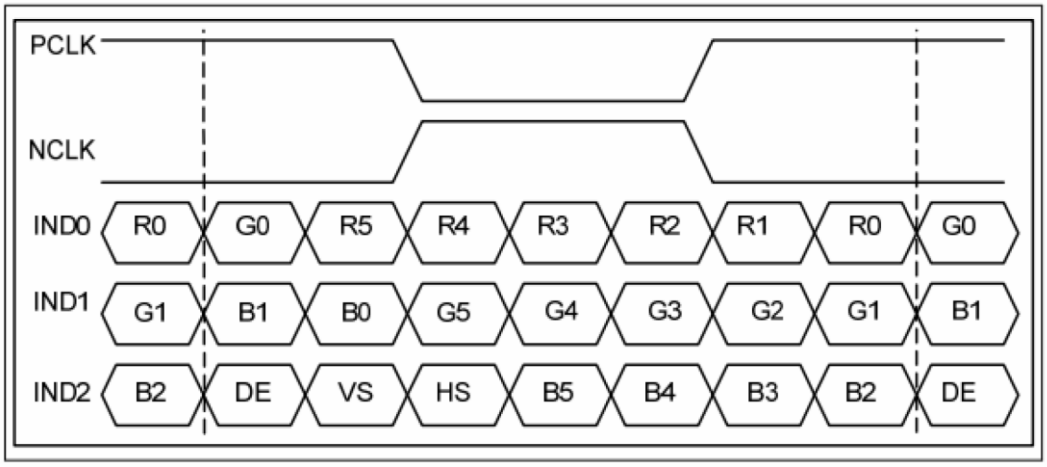
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3	3.3	3.6	V	
Input Signal Voltage	ViH	0.8 VDD		VDD	V	
	ViL	0		0.2VDD	V	

5.2 Switching Characteristics for LVDS Receiver

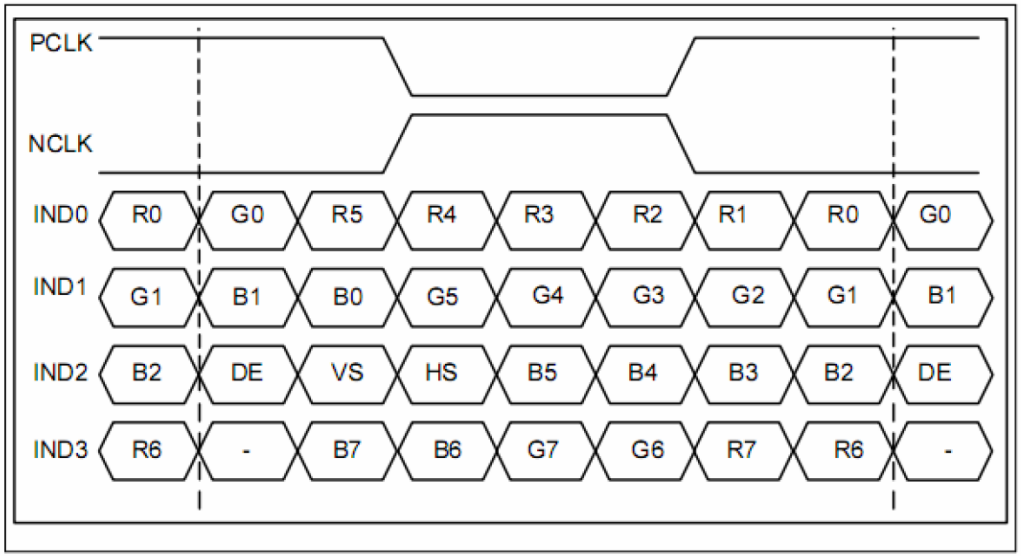
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth			100	mV	V_{CM}=1.2V
Differential Input Low Threshold	Vtl	-100			mV	
Input Current	I_{IN}	-10		10	uA	
Differential input Voltage	$\|V_{ID}\|$	0.1		0.6	V	
Common Mode Voltage Offset	V_{CM}	0.7	1.2	1.6	V	

5.3 Bit LVDS input

5.3.1 6Bit LVDS input



5.3.2 8Bit LVDS input

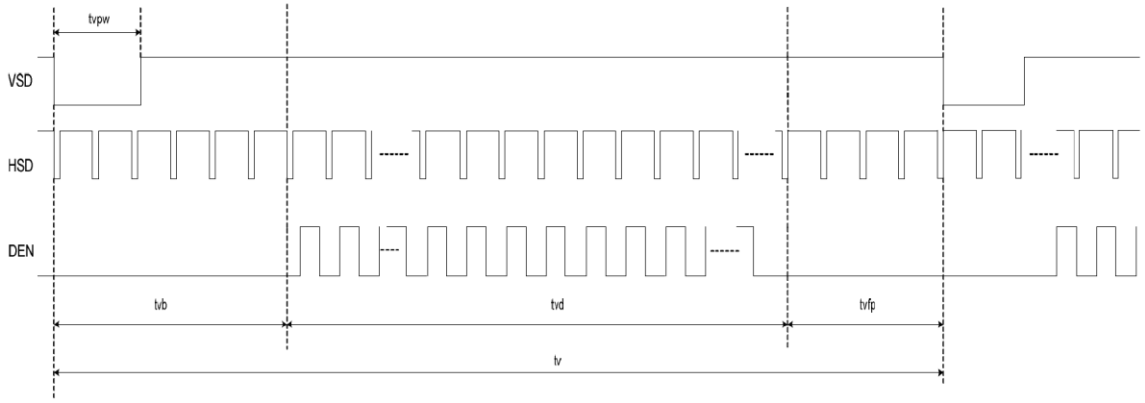


5.4 Interface Timing (DE mode)

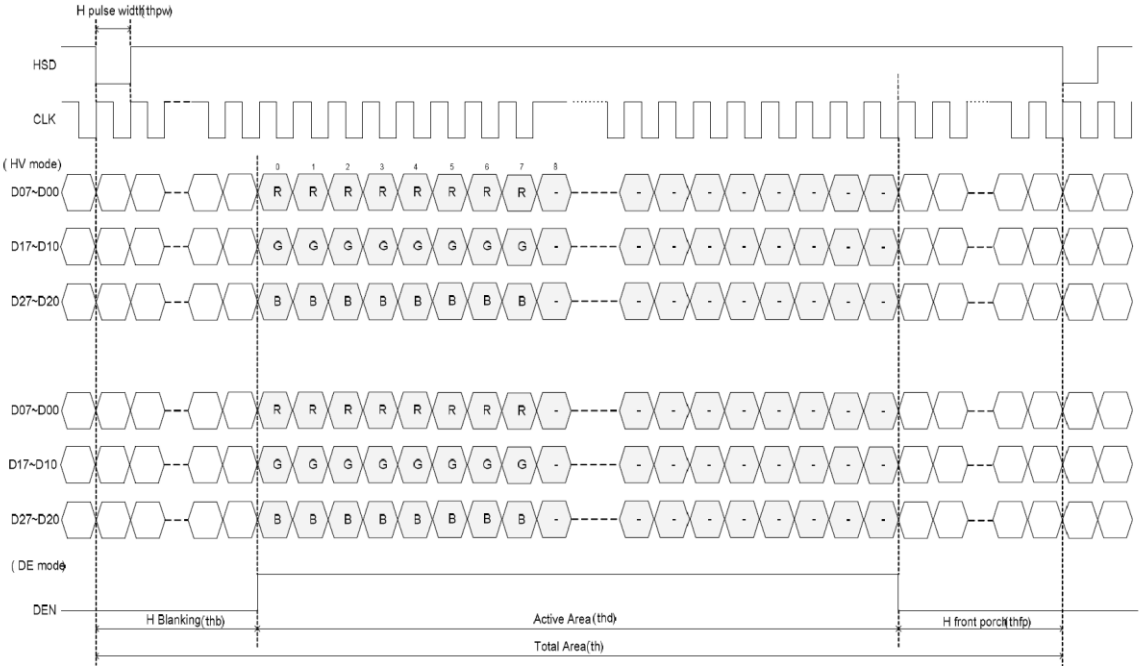
DE mode					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	52	65	71	Mhz
Horizontal display area	thd		1024		DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		768		H
VSYNC period time	tv	778	806	845	H
VSYNC blanking	tvb+tvfp	10	38	77	H

Timing Diagram of Interface Signal (DE mode)

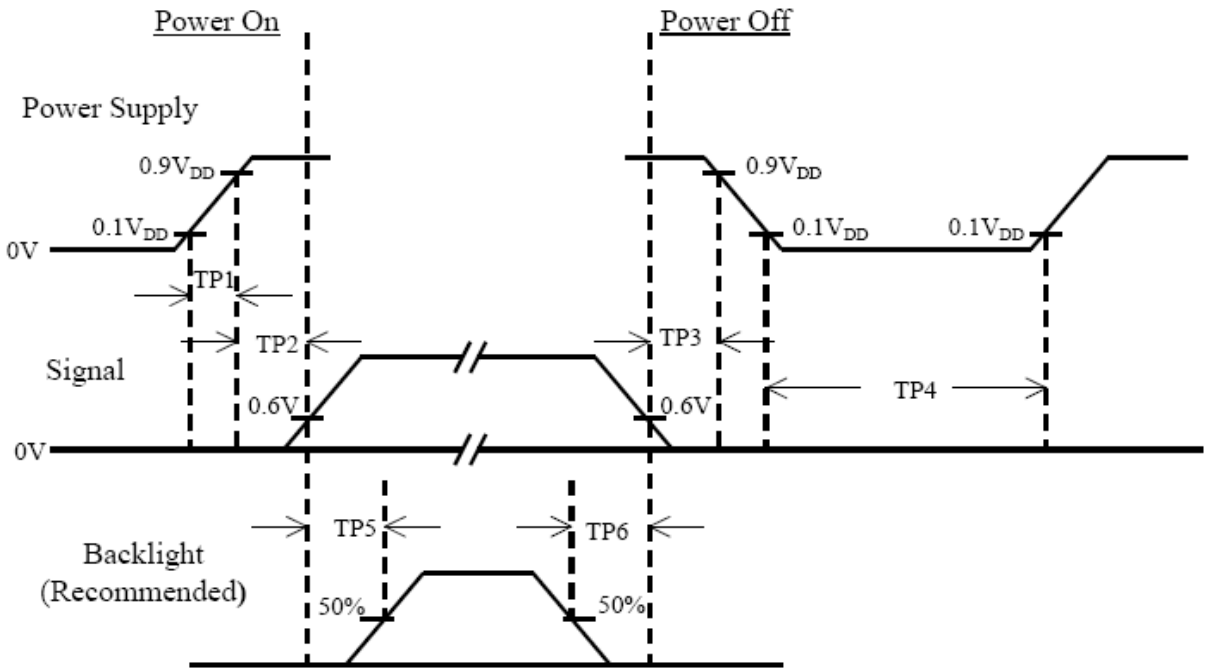
(1). Vertical input timing



(2). Horizontal input timing



5.5 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	200	--	--	msec	
TP6	200	--	--	msec	

Note：

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

(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.

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

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

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

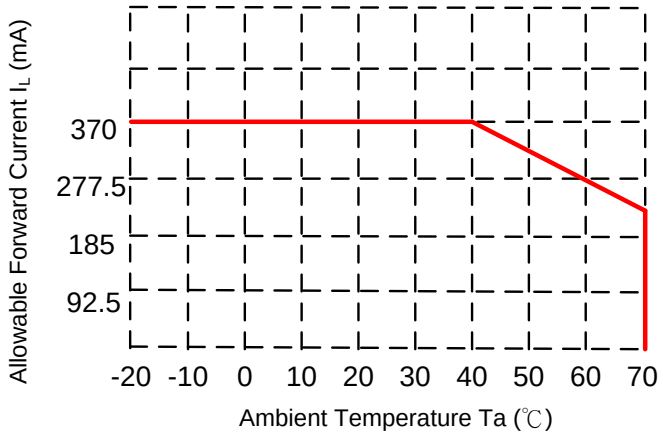
5.6 Backlight Unit

Parameter	Symbol	Values			Units	Condition
		Min	Typ.	Max		
LED Driver Input Voltage	VLED	--	12.0	--	V	
LED Driver Input Current	ILED	--	810	--	mA	100% duty
PWM Frequency	F_{PWM}	500		20K	Hz	
PWM Voltage High	V_{PWM_H}	2.4	3.3	5.0	V	
PWM Voltage Low	V_{PWM_L}	0	--	0.7	V	
LED Voltage	V_L	--	19.5	--	V	Ta=25℃
LED Current	I_L	--	370	--	mA	
LED Life-Time	N/A	30,000	--	--	Hour	Ta=25℃ I_L=370mA Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3oC, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃and IL=370mA. The LED lifetime could be decreased if operating IL is larger than 370mA. The constant current driving method is suggested.

Note (3) When LCM is operated over 40℃ ambient temperature, the I_L should be follow:



6. INTERFACE PIN CONNECTION

CN2 LVDS connector: P1.0 20pin/CP100-S20G-H16

Pin No.	Symbol	I/O	Description	Note
1	VDD	P	Power Voltage for Logic: 3.3V	
2	VDD	P	Power Voltage for Logic: 3.3V	
3	GND	P	Ground	
4	GND	P	Ground	
5	IN0-	I	- LVDS differential data input	
6	IN0+	I	+ LVDS differential data input	
7	GND	P	Ground	
8	IN1-	I	- LVDS differential data input	
9	IN1+	I	+ LVDS differential data input	
10	GND	P	Ground	
11	IN2-	I	- LVDS differential data input	
12	IN2+	I	+ LVDS differential data input	
13	GND	P	Ground	
14	CLK-	I	- LVDS differential data input	
15	CLK+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	IN3-	I	- LVDS differential data input	
18	IN3+	I	+ LVDS differential data input	
19	VLED	-	Power Voltage for LED: 12V	
20	ADJ	-	PWM Signal	

7. TOUCH PANEL ELECTRICAL SPECIFICATION

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	Multi-touch
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx.100 points/sec
Interface	USB
Control IC	ILI2511
Conductive susceptibility IEC/EN61000-4-6	10Vrms
Radiated Susceptibility IEC/EN61000-4-3	30V/m
Cover Glass	1.1mm chemically strength glass with black border
Bonding method	CG to sensor: optical bonding
	TP module to LCM: tape bonding

Specify the normal operating condition

(GND=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VDD	4.75	5.0	5.25	V	
Power Consumption	IVDD		T.B.D		mA	

Interface

Pin No.	Symbol	Function
1	VCC 5V	USB power input 5V
2	D+	USB Data+
3	D-	USB Data-
4	NC	No connection
5	NC	No connection
6	GND	POWER GND

8. RELIABILITY TEST CRITERIA

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 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. USE PRECAUTIONS

9.1 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.

9.2 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.

9.3 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.

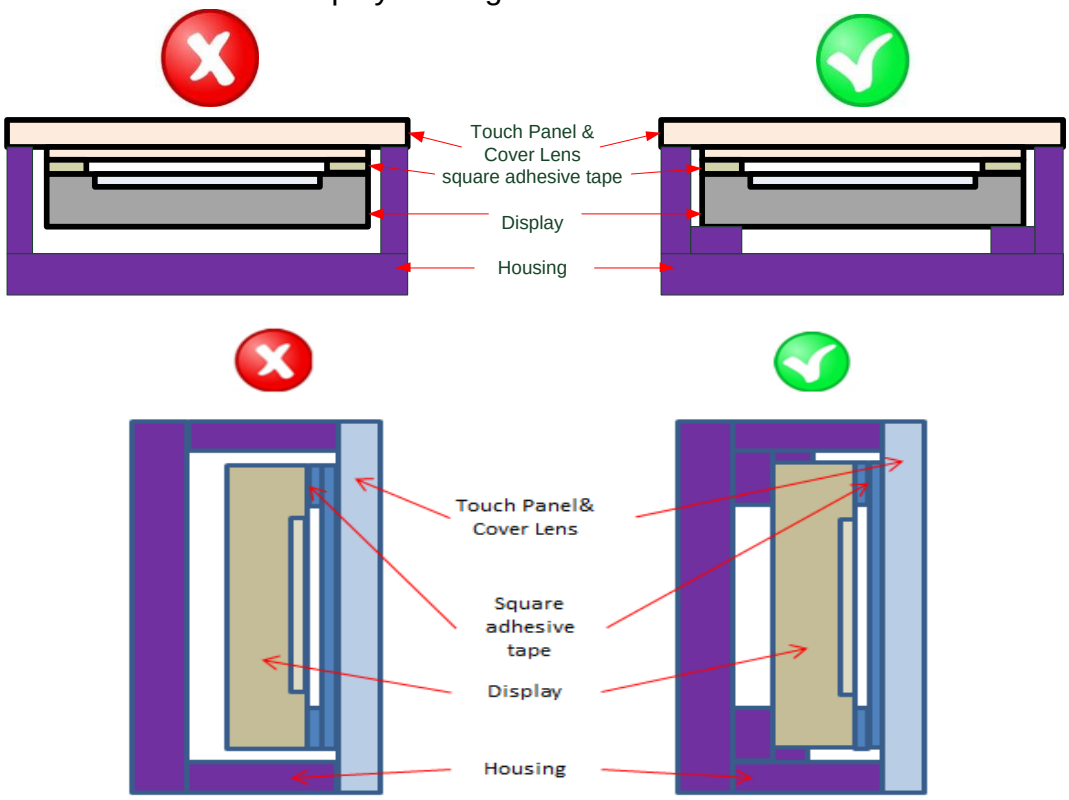
9.4 Operating precautions

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.

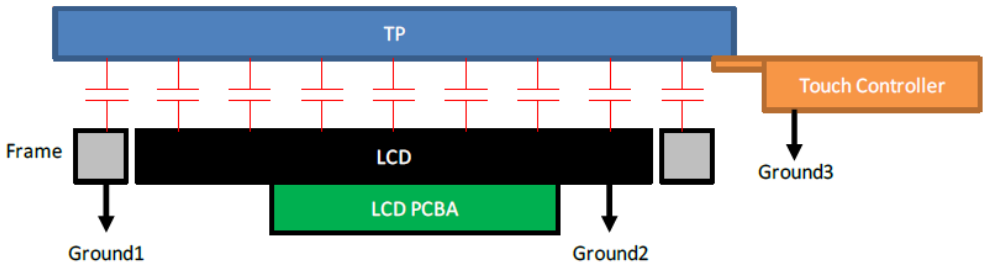
9.5 Mechanism

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.



3) 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.

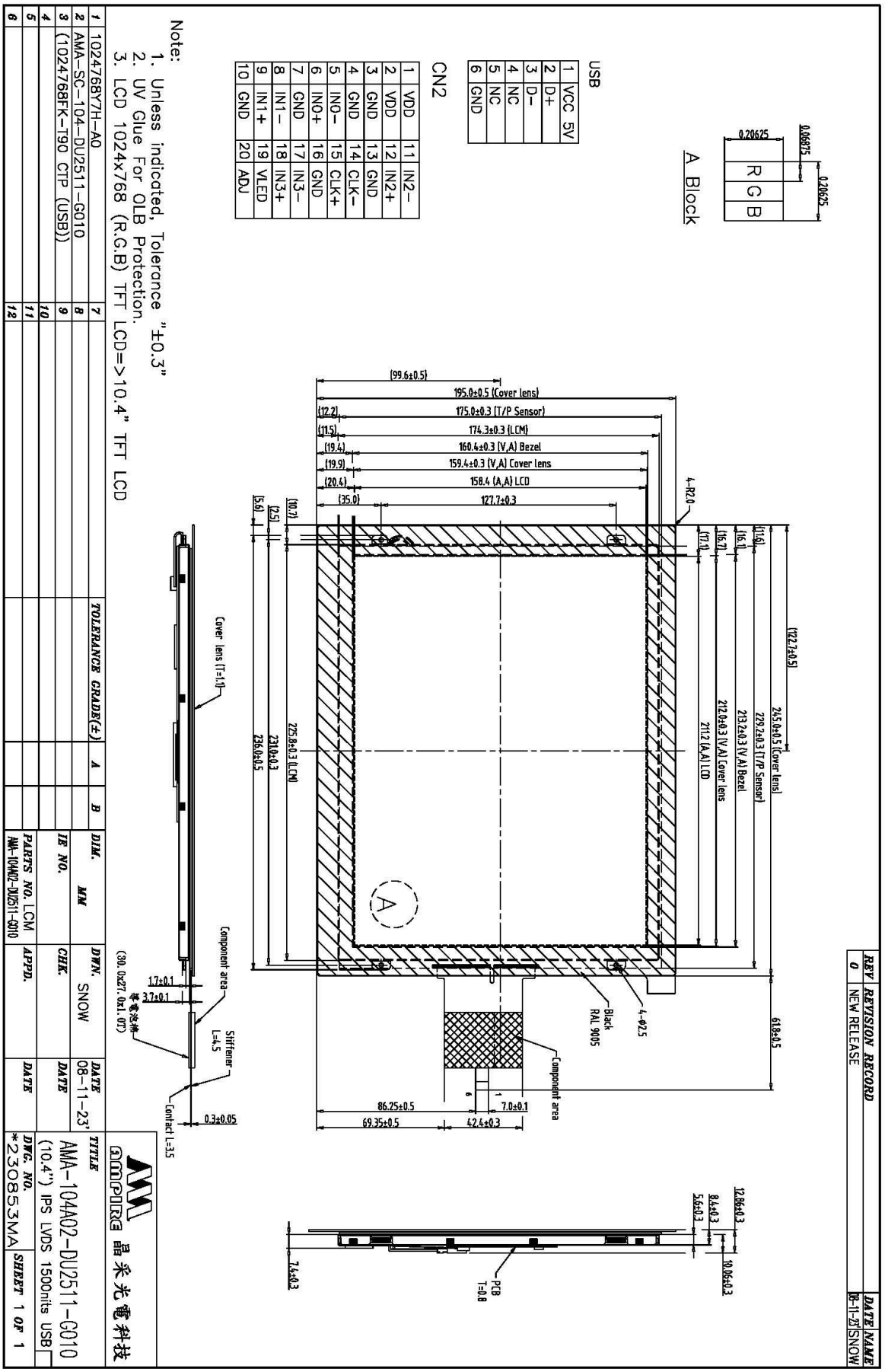


GND1, GND2 and GND3 should be connected together to have the same ground

9.6 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.

10. OUTLINEDIMENSION



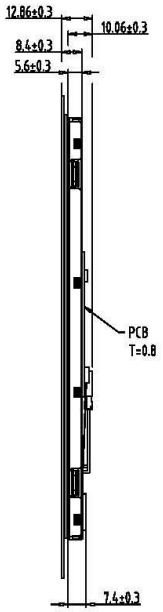
REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	08-11-23	SNOW

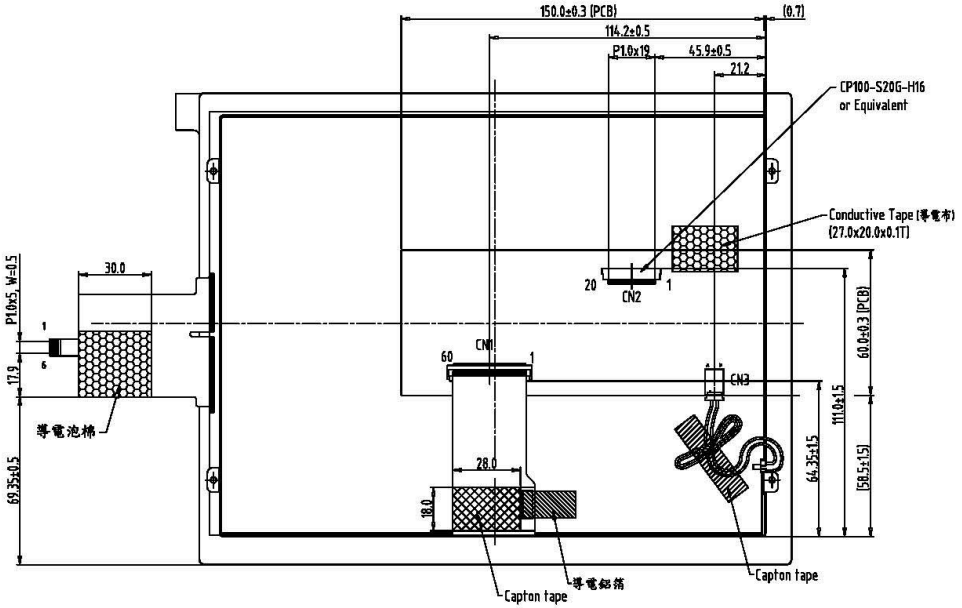
USB

1	VCC 5V
2	D+
3	D−
4	NC
5	NC
6	GND

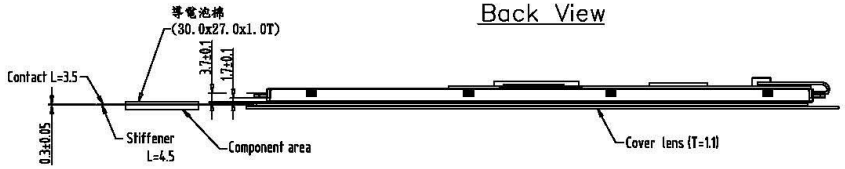
CN2

1	VDD	11	IN2−
2	VDD	12	IN2+
3	GND	13	GND
4	GND	14	CLK−
5	IN0−	15	CLK+
6	IN0+	16	GND
7	GND	17	IN3−
8	IN1−	18	IN3+
9	IN1+	19	VLED
10	GND	20	ADJ





Back View



Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 1024x768 (R.G.B) TFT LCD=>10.4" TFT LCD

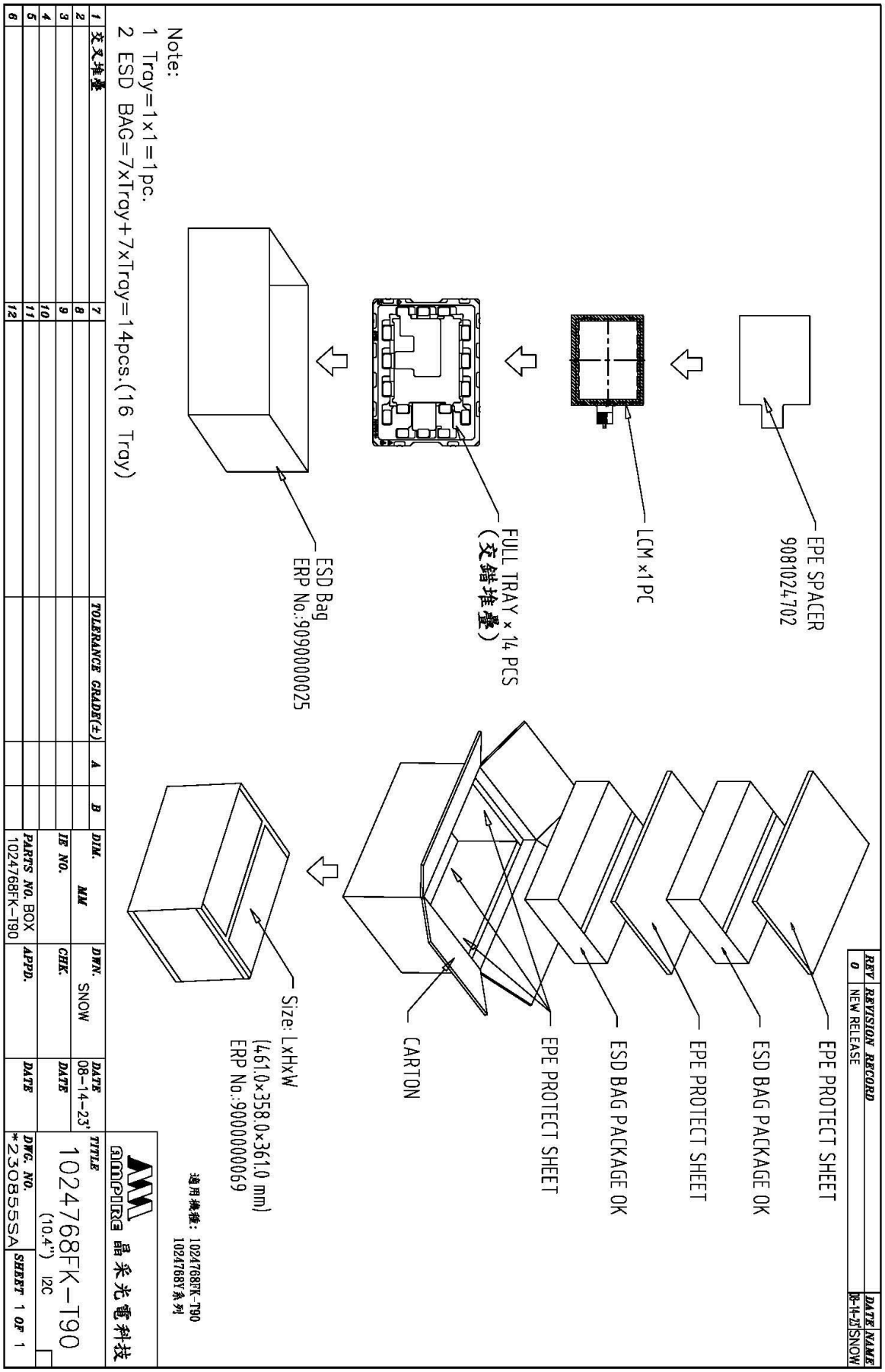
				TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. SNOW	DATE 08-11-23	TITLE
1	1024768Y7H-A0	7								AMA-104A02-DU2511-G010
2	AMA-SC-104-DU2511-G010	8					IE NO.	CHK.	DATE	(10.4") IPS LVDS 1500nits USB
3	(1024768FK-T90 CTP (USB))	9								
4		10								
5		11					PARTS NO. LCM-1 AMA-104A02-DU2511-G010	APPD.	DATE	DWG. NO. *230854MA SHEET 1 OF 1
6		12								

AMPIRE 晶采光電科技

AMPIRE CO., LTD.

Date: 2023/08/16

11. PACKAGE


EPE SPACER
9081024702
LCM ×1 PC
FULL TRAY × 14 PCS
(交錯堆疊)
ESD Bag
ERP No.:9090000025
EPE PROTECT SHEET
ESD BAG PACKAGE OK
EPE PROTECT SHEET
ESD BAG PACKAGE OK
EPE PROTECT SHEET
CARTON
Size: LxHxW
(461.0×358.0×361.0 mm)
ERP No.:9000000069
Note:
1 Tray=1×1=1pc.
2 ESD BAG=7×Tray+7×Tray=14pcs.(16 Tray)
REV
REVISION RECORD
DATE
NAME
0
NEW RELEASE
08-14-23'
SNOW
交叉堆疊
TOLERANCE GRADE(±)
A
B
DIM.
MM
IE NO.
PARTS NO. BOX
1024768FK-T90
DWN.
SNOW
CHK.
APPD.
DATE
08-14-23'
DATE
DATE
適用機種: 1024768FK-T90
1024768Y系列
晶采光電科技
TITLE
1024768FK-T90
(10.4") I2C
DWG. NO.
*2308555A
SHEET 1 OF 1