



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-070A01-DU2511-G010
APPROVED BY	
DATE	

☒ Approved For Specifications

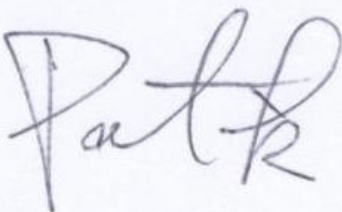
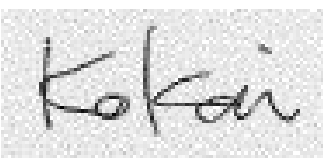

☐ Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2018/2/8	--	New Release	Emil

1. Features

7 inch module 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 7.0 (16:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixel) resolution.

- (1) Construction: 7" a-Si TFT active matrix, White LED Backlight.
- (2) Resolution (pixel): 800(R.G.B) X 480
- (3) Number of the Colors : 262K colors (R , G , B 6 bit digital each)
- (4) LCD type : Transmissive , normally White
- (5) Viewing Direction: 6 O'clock (Gray Inversion).
- (6) Interface : LVDS interface
- (7) 4 Layers PCB.
- (8) PCAP touch screen with ILI2511 touch controller (USB).

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
LCD size	7 inch (Diagonal)	
Number of Pixel	800 RGB (H) x 480 (V)	pixels
Pixel pitch	0.1905 (H) x 0.1905 (V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	
Back-light	Single LED (Side-Light type)	
View Direction (Gray Inversion)	6 o'clock	

3. ABSOLUTE MAX. RATINGS

3-1 Electrical Absolute Rating

3-1-1 TFT LCD Module

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power voltage	VDD	-0.5	4.0	V	GND=0V
Voltage range at any terminal		-0.5	VDD+0.3	V	

3-2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	Topa	-20	70	°C	
Storage Temperature	Tstg	-30	80	°C	

4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LCD Supply Voltage	VDD	3.0	3.3	3.6	V	-
LCD Supply Current	IDD	-	180	230	mA	(1)
Power Supply Voltage For LED Driver	VLED	3.3	--	5	V	(1)
Power Supply Current For LED Driver	ILED	--	382	--	mA	VLED=5V
LVDS DRIVER DC SPECIFICATIONS						
Differential Output Voltage	VOD	250	350	450	mV	RL=100ohm
Change in VOD between Complimentary Output States	ΔVOD	-	-	35	mV	
Common Mode Voltage	VOC	1.125	1.25	1.375	V	
Change in VOC between Complimentary Output States	ΔVOC	-	-	35	mV	
LVDS RECEIVER DC SPECIFICATIONS						
Differential Input High Threshold	VTH	-	-	+100	mV	VOC=+1.2V
Differential Input Low Threshold	VTL	-100	-	-	mV	

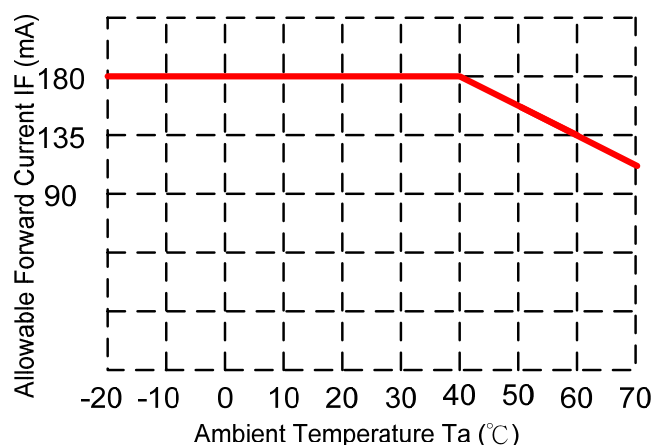
Note1: Ta=25°C , Display pattern : All Black

4-2 Backlight Unit

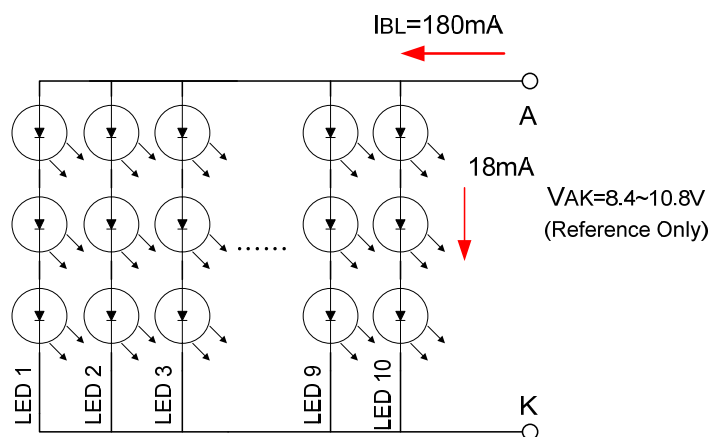
Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Driver Voltage	VLED	3.3	-	5	V	
Power Supply Current For LED Driver	ILED	-	380	-	mA	VLED=5V VADJ=3.3V (duty 100%)
ADJ Input Voltage	V _{ADJ}	-	3.3	-	V	duty=100% Note(3)
LED voltage	V _{BL}	8.4	9.0	10.8	V	For reference
LED current	IBL	--	180	--	mA	Ta=25°C
		--	135	--	mA	Ta=60°C
LED Life Time	-	--	40K	--	Hour	Note (2)

Note (1) The constant current source is needed for white LED back-light driving.

When LCM is operated over 60 °C ambient temperature, the I_{LED} of the LED back-light should be adjusted to 135mA max°C



Note (2) Brightness to be decreased to 50% of the initial value.

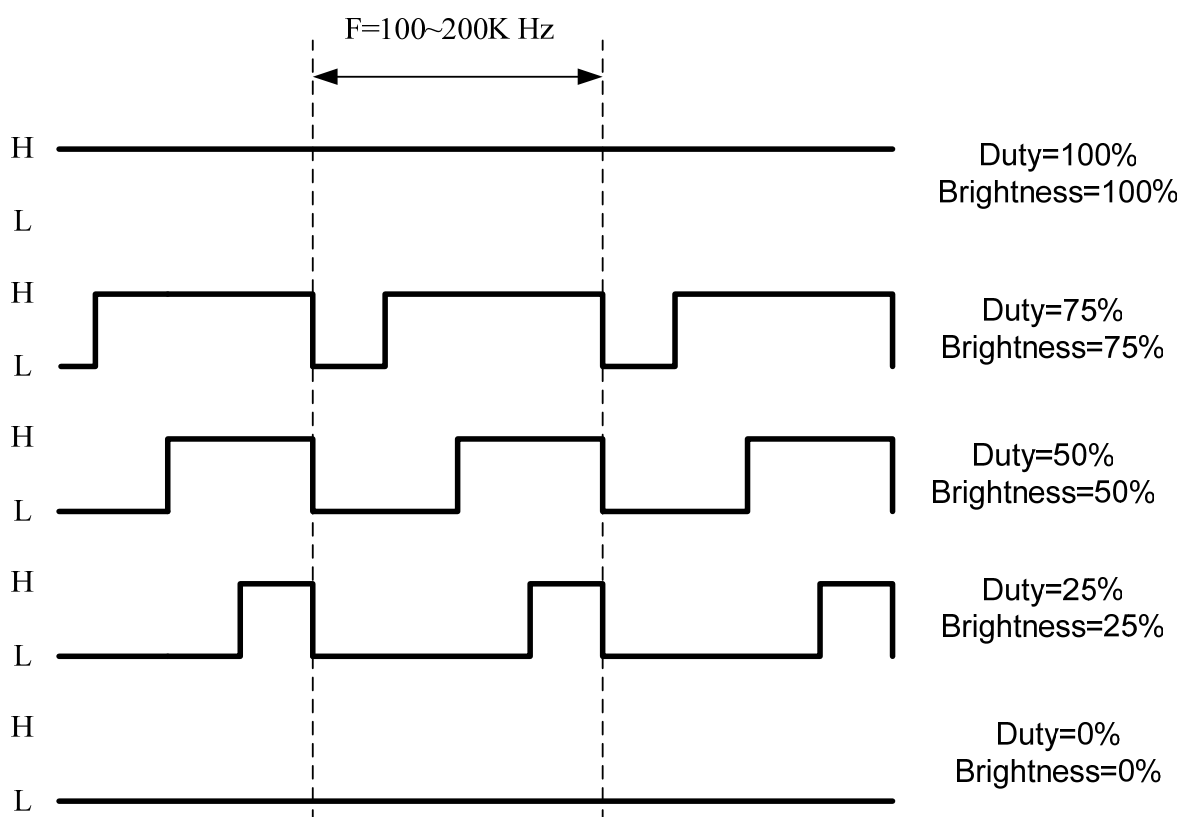


LED Light Bar Circuit

Note(3) VLEDADJ is PWM signal input. It is for brightness control.

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
LEDADJ signal frequency	f_{PWM}	100	50K	200K	Hz
LEDADJ signal logic level High	V_{IH}	2V	--	VLED (5.0V)	V
LEDADJ signal logic level Low	V_{IL}	0	--	0.5	V
LEDADJ Dimming duty	D	5%	--	100%	

DIM Duty



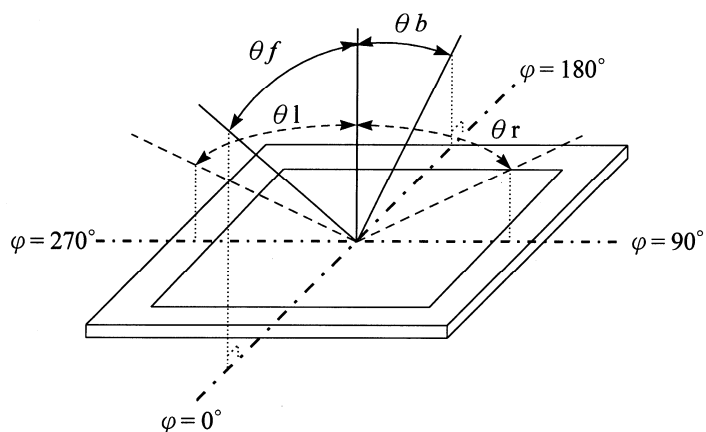
5. Optical Specifications

5-1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Front	θf	$CR \geq 10$	50	60	--	deg.	(1)(2)(3)
	Back	θb		60	70	--		
	Left	θl		60	70	--		
	Right	θr		60	70	--		
Contrast ratio		CR	$\Theta = \Phi = 0^\circ$	250	400	--	--	(1)(3)
Response Time		T_r		--	5	10	ms	(1)(4)
		T_f		--	11	16	ms	(1)(4)
Color chromaticity	White	W_x	$\Theta = \Phi = 0^\circ$	0.267	0.317	0.367	--	(1)
		W_y		0.295	0.345	0.395		
	Red	R_x		0.531	0.581	0.631		
		R_y		0.311	0.361	0.411		
	Green	G_x		0.304	0.354	0.404		
		G_y		0.514	0.564	0.614		
	Blue	B_x		0.098	0.148	0.198		
		B_y		0.074	0.124	0.174		
Luminance		L	$\Theta = \Phi = 0^\circ$	340	425	--	cd/m ²	(1)(5)
Luminance Uniformity		ΔL	$\Theta = \Phi = 0^\circ$	70	--	--	%	(1)(5)(6)

Note 1: $T_a = 25^\circ\text{C}$. To be measured on the center area of panel after 10 minutes operation.

Note 2: Definition of Viewing Angle



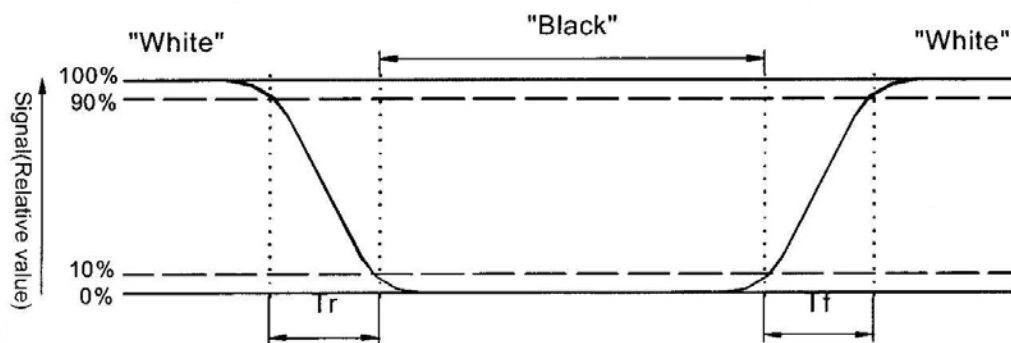
Note 3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

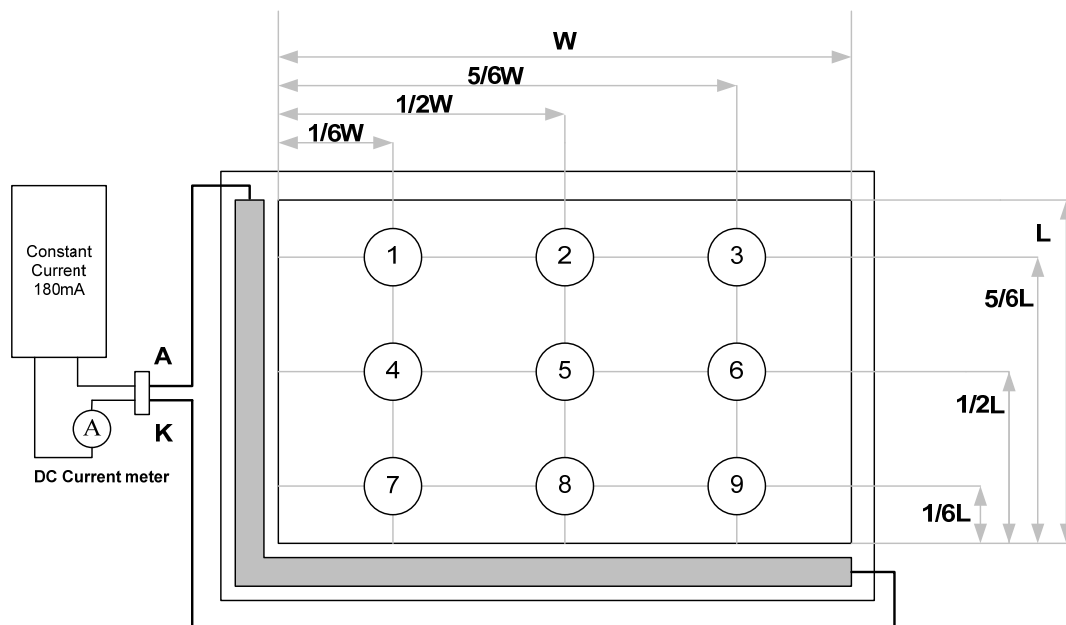
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note 4: 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.



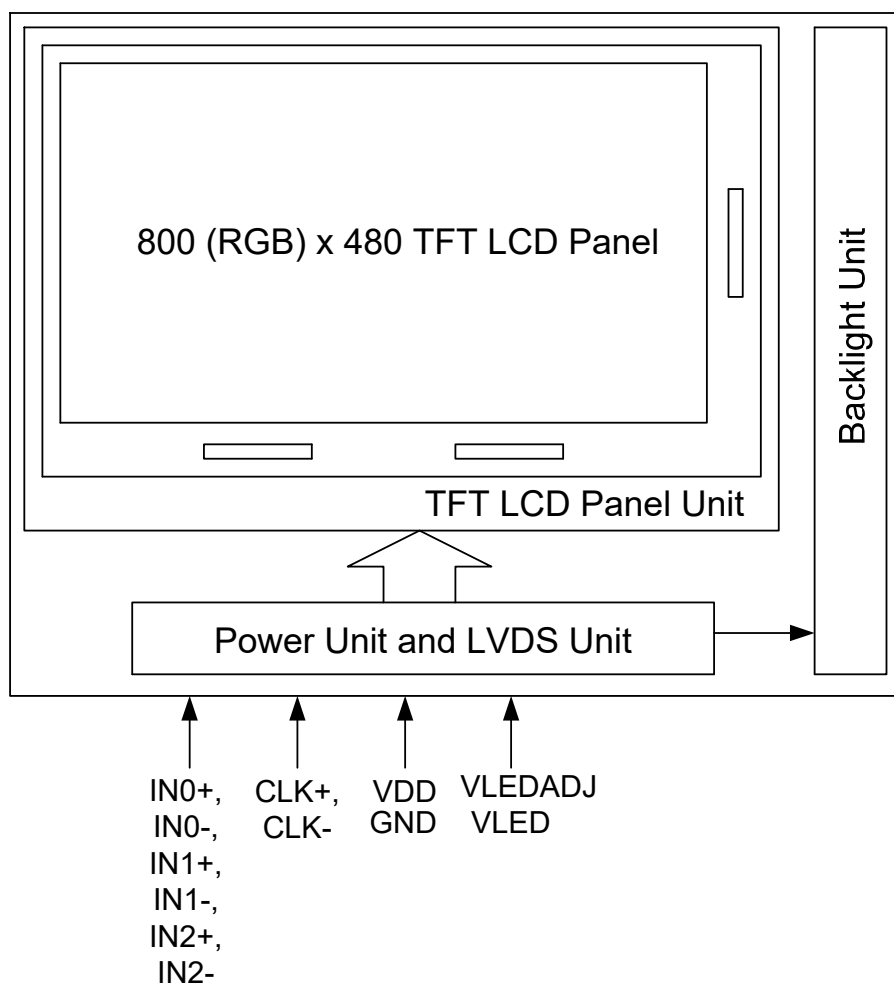
Note 5 : Luminance is measured at point 5 of the display.



Note 6 : Definition of Luminance Uniformity

$$\Delta L = [L(\text{min.}) \text{ of 9 points} / L(\text{max.}) \text{ of 9 points}] \times 100\%$$

6. Block Diagram



7. INTERFACE

Pin No.	Symbol	Function
1	VDD	POWER SUPPLY:3.3V
2	VDD	POWER SUPPLY:3.3V
3	GND	Power Ground
4	GND	Power Ground
5	IN0-	Transmission Data of Pixels
6	IN0+	Transmission Data of Pixels
7	GND	Power Ground
8	IN1-	Transmission Data of Pixels 1
9	IN1+	Transmission Data of Pixels 1
10	GND	Power Ground
11	IN2-	Transmission Data of Pixels 2
12	IN2+	Transmission Data of Pixels 2
13	GND	Power Ground
14	CLK-	Sampling Clock
15	CLK+	Sampling Clock
16	GND	Power Ground
17	VLED	POWER SUPPLY for Backlight : 5V
18	VLED	POWER SUPPLY for Backlight : 5V
19	GND	Power Ground
20	LEDADJ	LED PWM SIGNAL

8. Projected capacitive-type TOUCH PANEL ELECTRICAL SPECIFICATION

Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	Multi-finger
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	VIN	4.75	5.0	5.25	V	
Power Consumption	I _{VIN}		T.B.D		mA	

Interface

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

9. INPUT SIGNAL :

9-1 LVDS Signal

switching characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
t_{su} Setup time, D0–D20 to CLKOUT↓	$C_L = 8 \text{ pF}$, See Figure 5	5			ns
t_h Data hold time, CLKOUT↓ to D0–D20		5			ns
$t_{(RSKM)}$ Receiver input skew margin§ (see Figure 7)	$t_c = 15.38 \text{ ns } (\pm 0.2\%)$, Input clock jitter < 50 ps¶	550	700		ps
t_d Delay time, CLKIN↑ to CLKOUT↓ (see Figure 7)	$V_{CC} = 3.3 \text{ V}$, $t_c = 15.38 \text{ ns } (\pm 0.2\%)$, $T_A = 25^\circ\text{C}$	3	5	7	ns
t_{en} Enable time, $\overline{\text{SHTDN}}$ to phase lock	See Figure 7		1		ms
t_{dis} Disable time, $\overline{\text{SHTDN}}$ to off state	See Figure 8		400		ns
t_t Transition time, output (10% to 90% t_r or t_f) (data only)	$C_L = 8 \text{ pF}$		3		ns
t_t Transition time, output (10% to 90% t_r or t_f) (clock only)	$C_L = 8 \text{ pF}$		1.5		ns
t_w Pulse duration, output clock			$0.50 t_c$		ns

† All typical values are at $V_{CC} = 3.3 \text{ V}$, $T_A = 25^\circ\text{C}$.

§ The parameter $t_{(RSKM)}$ is the timing margin available to allocate to the transmitter and interconnection skews and clock jitter. The value of this parameter at clock periods other than 15.38 ns can be calculated from $t_{RSKM} = t_c/14 - 550 \text{ ps}$.

¶ |Input clock jitter| is the magnitude of the change in input clock period.

PARAMETER MEASUREMENT INFORMATION

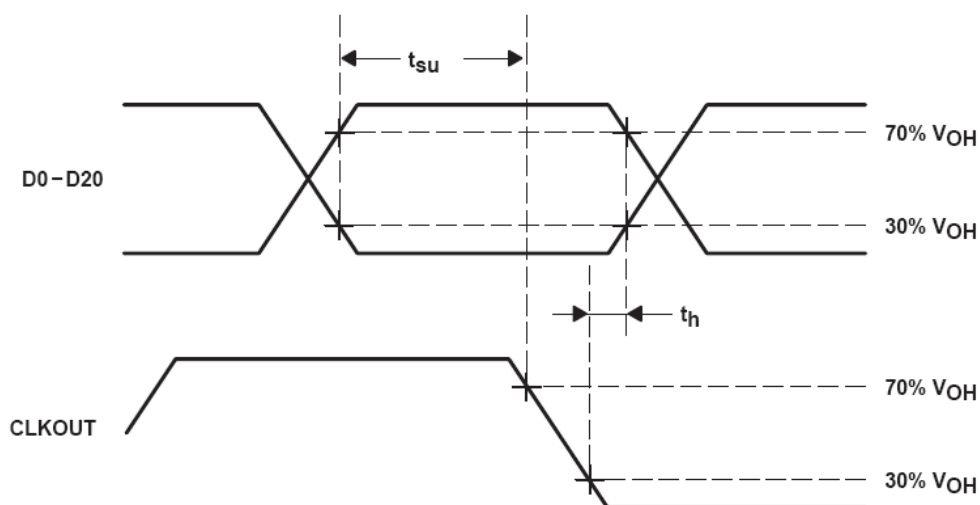


Figure 5. Setup and Hold Time Waveforms

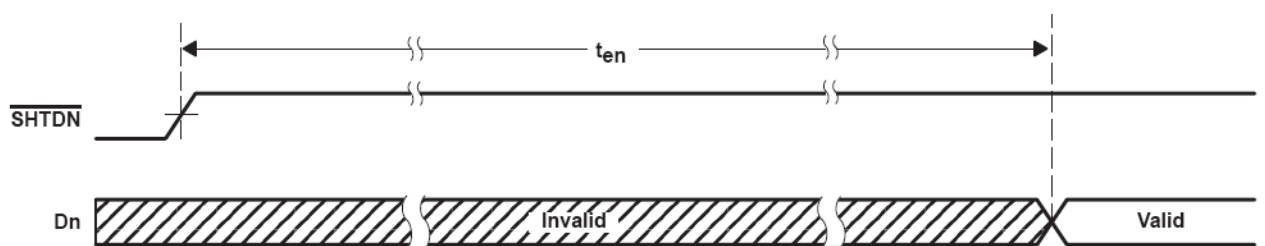
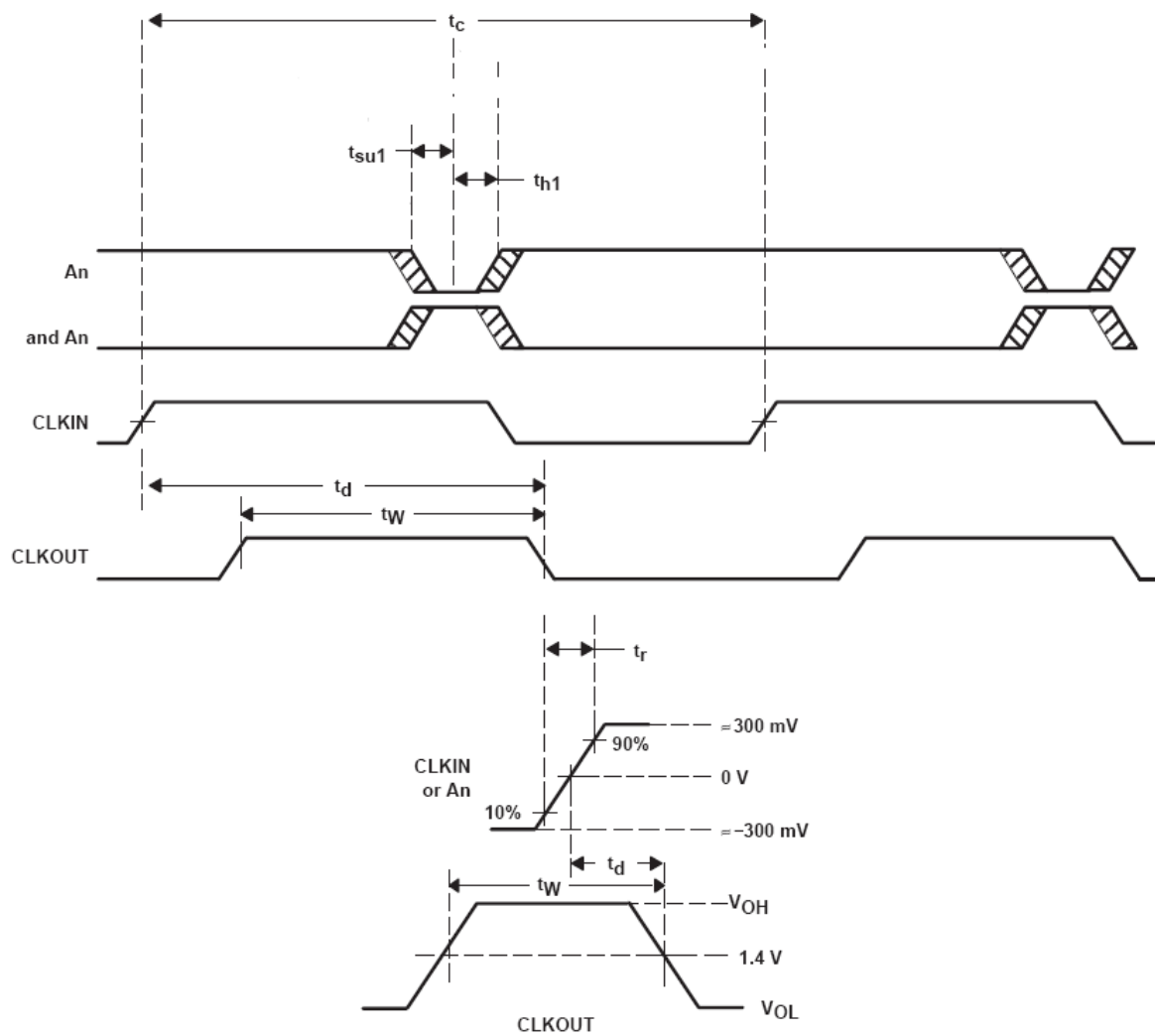


Figure 7. Enable Time Waveforms

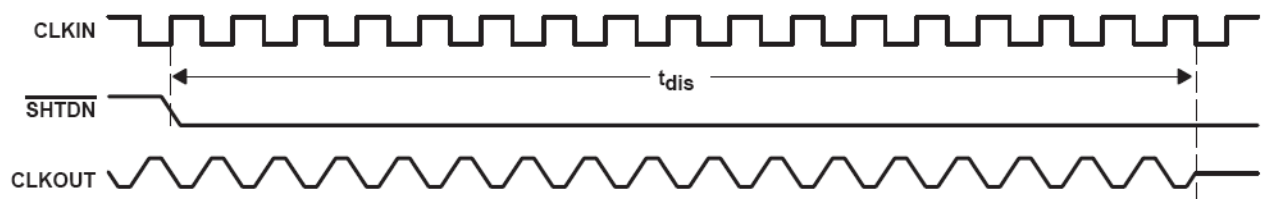
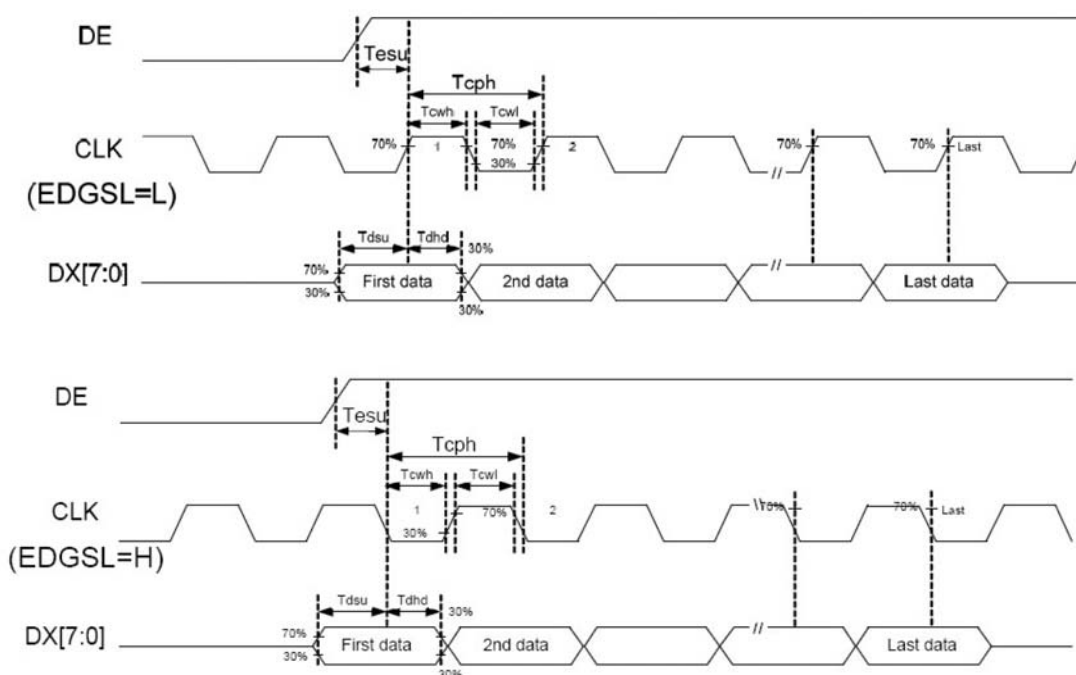


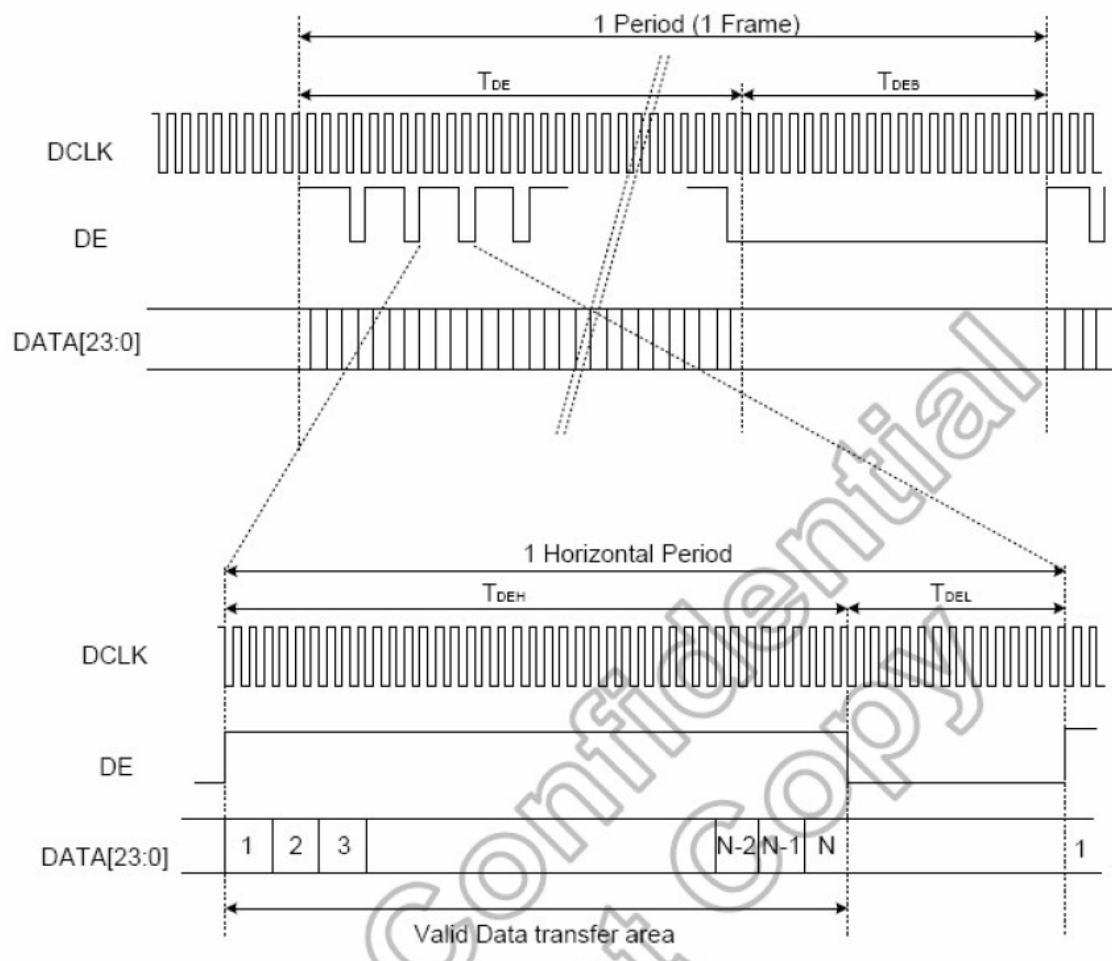
Figure 8. Disable Time Waveforms

9-2 Timing characteristic of Panel

Parameter	Symbol				Unit
		Min.	Typ.	Max.	
Data setup time	T_{dsu}	6	-	-	ns
Data hold time	T_{dhd}	6	-	-	T _{cph}
DE setup time	T_{esu}	6	-	-	T _{cph}
CLK frequency	F_{CPH}		33.26		MHz
CLK period	T_{CPH}		30.06		ns
CLK pulse duty	T_{CWH}	40	50	60	%
DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T _{CPH}
DE pulse width	T_{DEH}	-	800	-	T _{CPH}
DE frame blanking	T_{DEB}	10	45	110	T _{DEH} +T _{DEL}
DE frame width	T_{DE}	-	480	-	T _{DEH} +T _{DEL}

Note : We suggest using the typical value, so it can have better performance.





10. DISPLAYED COLOR AND INPUT DATA

	Color & Gray Scale	DATA SIGNAL																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

11. RELIABILITY TEST

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	40°C, 85% RH , 240 hrs	1,2
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 100 cycle(Dry)	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.

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.

12. GENERAL PRECAUTION

12-1 Safety

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.

12-2 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.

12-3 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.

12-4 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.

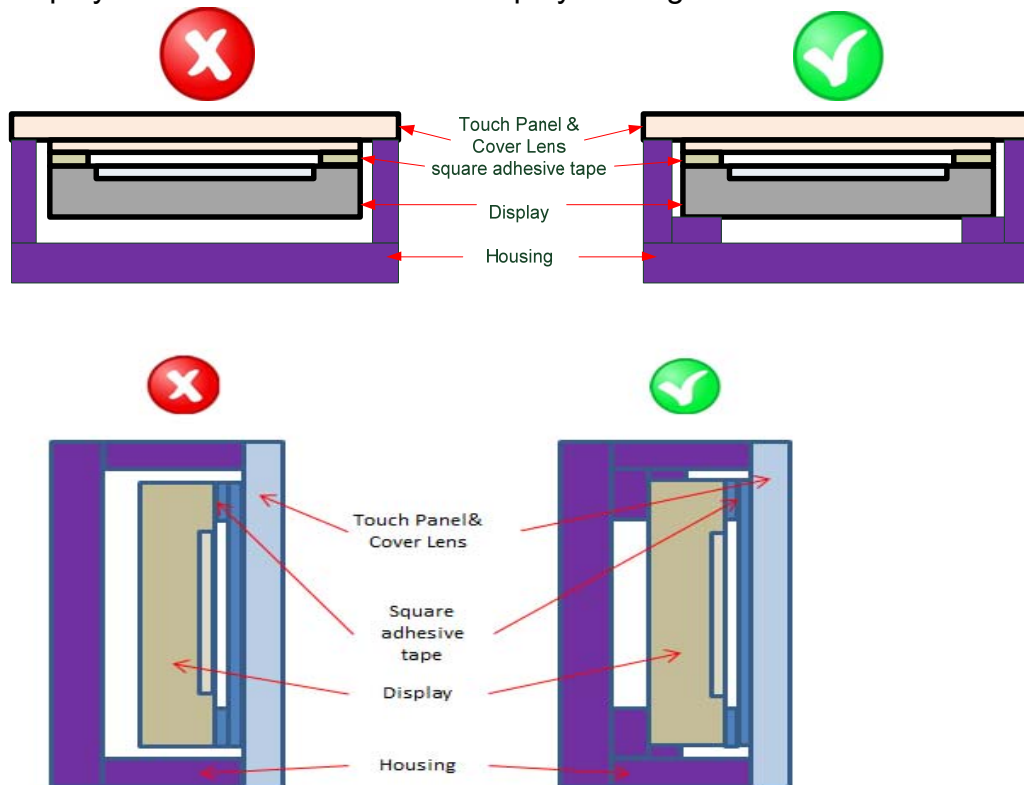
12-5 Cleaning

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.

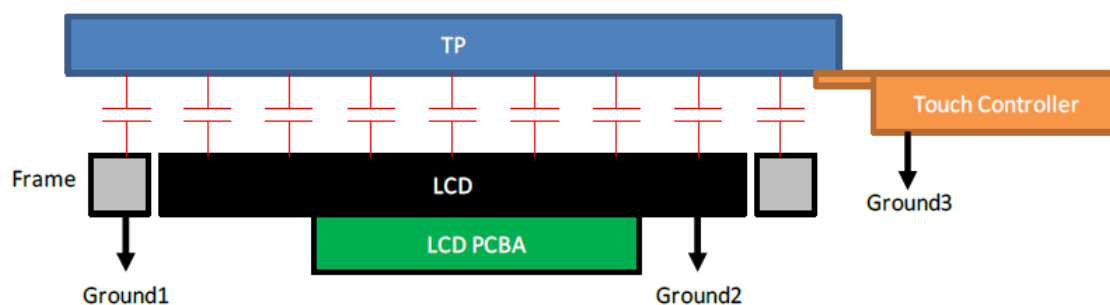
12.6 Mechanism (if the LCM using air bonding)

(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.

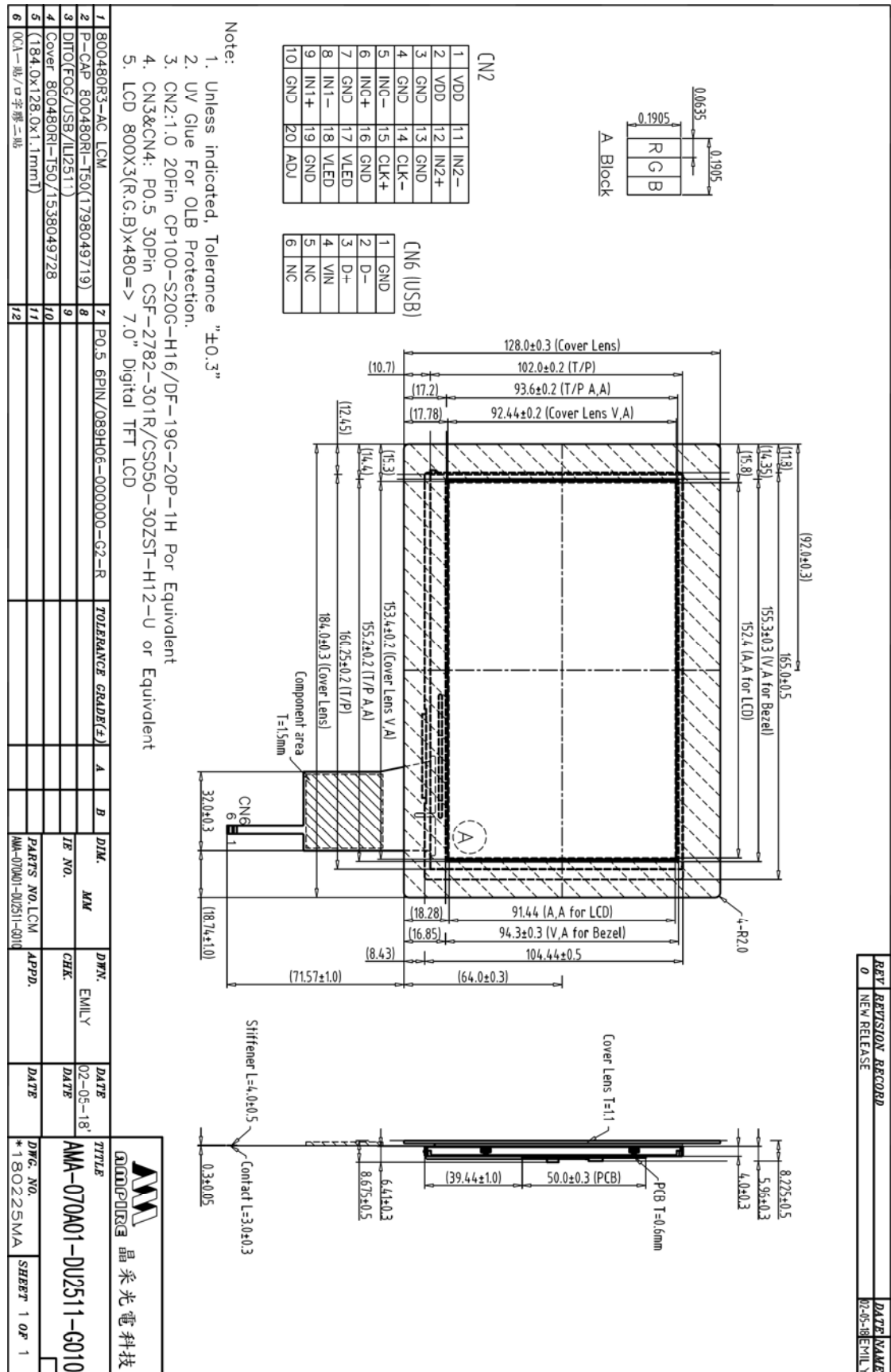


GND1, GND2 and GND3 should be connected together to have the same ground

12-7 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

13. OUTLINE DIMENSION



[illegible]