



晶采光電科技股份有限公司  
AMPIRE CO., LTD.

## SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AM-800480RSTMQW-TDIH</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

Preliminary Specification

Approved Specification

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Approved by	Checked by	Organized by
Kokai	Jessica	Simon

This Specification is subject to change without notice.

## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2020/08/03	--	New Release	Simon

## 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 , a back light system and capacitive touch panel . 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.
- (6) LVDS Interface.
- (7) Built-in LED driver.
- (8) Touch Panel with USB interface. Touch controller : EXC80W32
- (9) Sunlight readable by Single Nano optical lamination
- (10) 800480RL Cover Lens (174.0\*118.0\*4.0mm)

## 2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
LCD size	7 inch (Diagonal)	
Outline Dimension (Include connecter)	174x 118 x 11.965 (typ.)	mm
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)	
Brightness	425 nit	cd/m <sup>2</sup>
Contrast ratio	400 : 1	
Power consumption (B/L system)	4 (max.)	W

### 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	

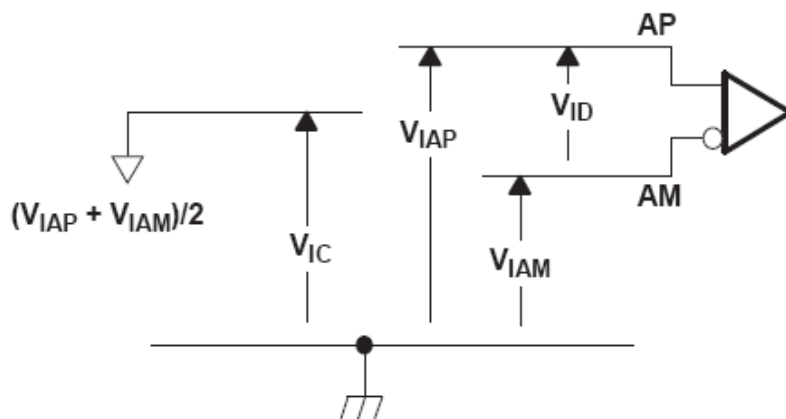
#### 3-2 Environment Absolute Rating

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 voltage

		MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage	3	3.3	3.6	V
$V_{IH}$	High-level input voltage ( $\overline{SHTDN}$ )	2			V
$V_{IL}$	Low-level input voltage ( $\overline{SHTDN}$ )			0.8	V
$ V_{ID} $	Magnitude differential input voltage	0.1		0.6	V
$V_{IC}$	Common-mode input voltage	$\frac{ V_{ID} }{2}$		$2.4 - \frac{ V_{ID} }{2}$	V



ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
Power Supply Voltage For LCD	$V_{CC}$	3.0	3.3	3.6	V	
Power Supply Current For LCD	$I_{CC}$	-	180	230	mA	Black pattern

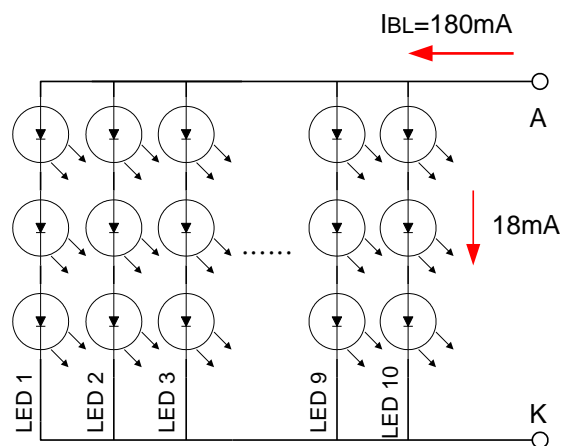
## 4-2 Backlight Unit

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
LED Backlight Voltage	$V_{BL}$	8.4	9.0	10.8	V	For reference
LED Backlight Current	$I_{BL}$	-	180	-	mA	$T_a=25^{\circ}\text{C}$
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 deg.C ambient temperature, the  $I_{LED}$  of the LED back-light should be adjusted to 135mA max

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
ADJ signal frequency	$f_{PWM}$	100	50K	200K	Hz
ADJ signal logic level High	$V_{IH}$	2V	--	VLED (5.0V)	V
ADJ signal logic level Low	$V_{IL}$	0	--	0.5	V

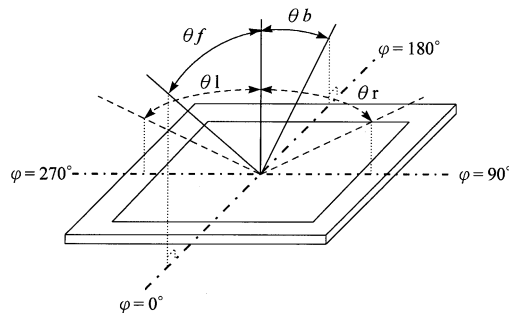
## 5. Optical Specifications

### 5-1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Front	$\theta f$	$CR \geq 10$	55	60	--	deg.	(1)(2)(3)
	Back	$\theta b$		55	70	--		
	Left	$\theta l$		65	70	--		
	Right	$\theta r$		65	70	--		
Contrast ratio		CR	$\Theta = \Phi = 0^\circ$	250	400	--	--	(1)(3)
Response Time		$T_r$	$\Theta = \Phi = 0^\circ$	--	5	10	ms	(1)(4)
		$T_f$		--	11	16	ms	(1)(4)
Color chromaticity	White	$W_x$	$\Theta = \Phi = 0^\circ$	0.239	0.299	0.359	--	(1)
		$W_y$		0.268	0.328	0.388		
Luminance		L	$\Theta = \Phi = 0^\circ$	340	425	--	cd/m <sup>2</sup>	(1)(5)
Luminance Uniformity		$\Delta L$	$\Theta = \Phi = 0^\circ$	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



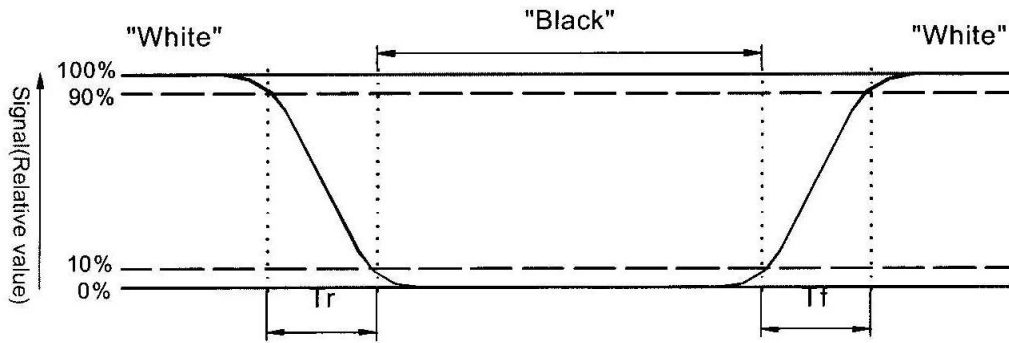
Note 3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

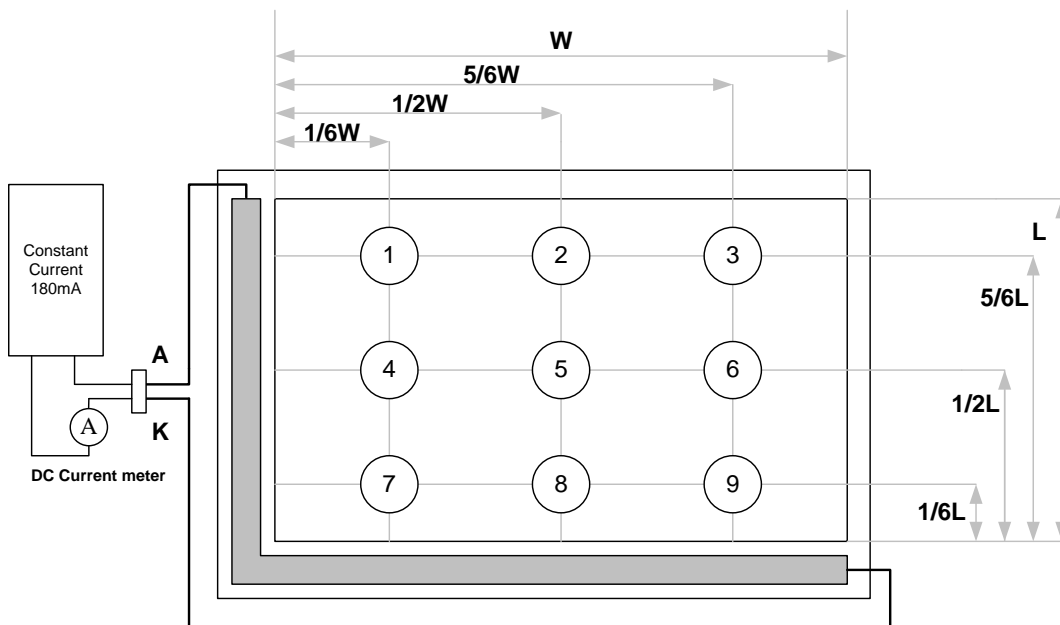
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

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

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



## 6. Touch Panel SPECIFICATION

### 6.1 Basic Characteristic

Item	Specification
Type	Projective Capacitive Touch Panel
Activation	Multi-fingers or Single-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx. 100 points/sec
Control IC	EXC80W32
Interface	USB

### 6.2 Electrical Absolute Max Rating

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power Supply voltage	VDD	-0.3	5.5	V	GND =0V

### 6.3 Electrical Characteristics

Specify the normal operating condition

(GND=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VDD	--	5.0	--	V	
Power Consumption	IVDD		TBD		mA	

### 6.4 Interface

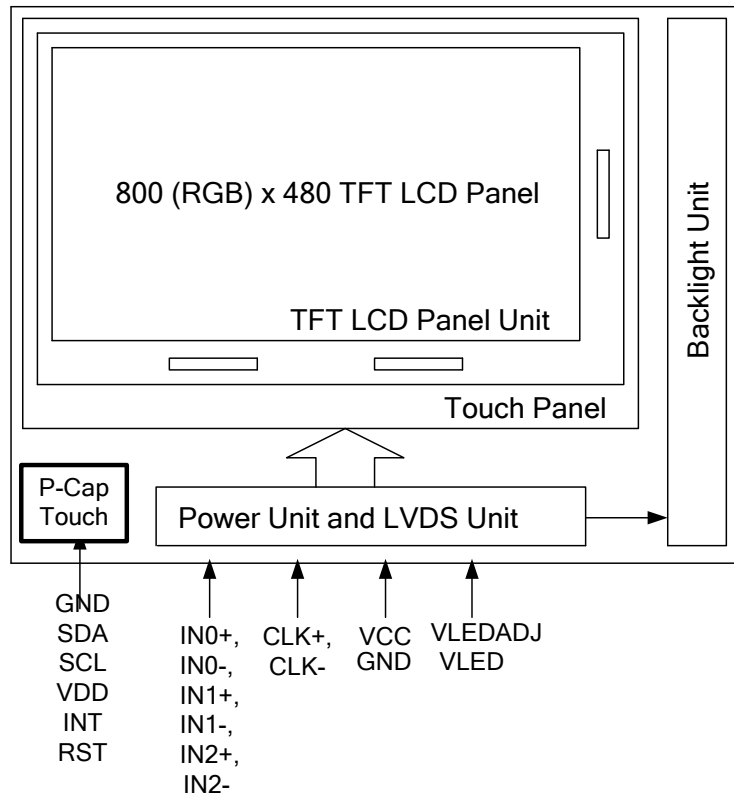
Pin	Name	Description
1	GND	Power GND
2	D-	USB Data-
3	D+	USB Data+
4	VDD	Power Supply 5.0V
5	NC	No connection
6	NC	No connection

## 7. INTERFACE

### 7-1 LCD Control 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 : <b>5V</b>
18	VLED	POWER SUPPLY for Backlight : <b>5V</b>
19	GND	Power Ground
20	ADJ	PWM SIGNAL

### 7-3 Block Diagram



## 8. INPUT SIGNAL :

### 8-1 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↓	5			ns
$t_h$	Data hold time, CLKOUT↓ to D0–D20	5			ns
$t_{(RSKM)}$	Receiver input skew margin§ (see Figure 7)	$t_c = 15.38 \text{ ns } (\pm 0.2\%),$ $ \text{Input clock jitter}  < 50 \text{ ps}¶$		700	ps
$t_d$	Delay time, CLKIN↑ to CLKOUT↓ (see Figure 7)	$V_{CC} = 3.3 \text{ V},$ $t_c = 15.38 \text{ ns } (\pm 0.2\%), T_A = 25^\circ\text{C}$		7	ns
$t_{en}$	Enable time, $\overline{\text{SHTDN}}$ to phase lock	1			ms
$t_{dis}$	Disable time, $\overline{\text{SHTDN}}$ to off state	400			ns
$t_t$	Transition time, output (10% to 90% $t_r$ or $t_f$ ) (data only)	3			ns
$t_t$	Transition time, output (10% to 90% $t_r$ or $t_f$ ) (clock only)	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  $t_{(RSKM)} = t_c/14 - 550 \text{ ps}$ .

¶  $|\text{Input clock jitter}|$  is the magnitude of the change in input clock period.

#### PARAMETER MEASUREMENT INFORMATION

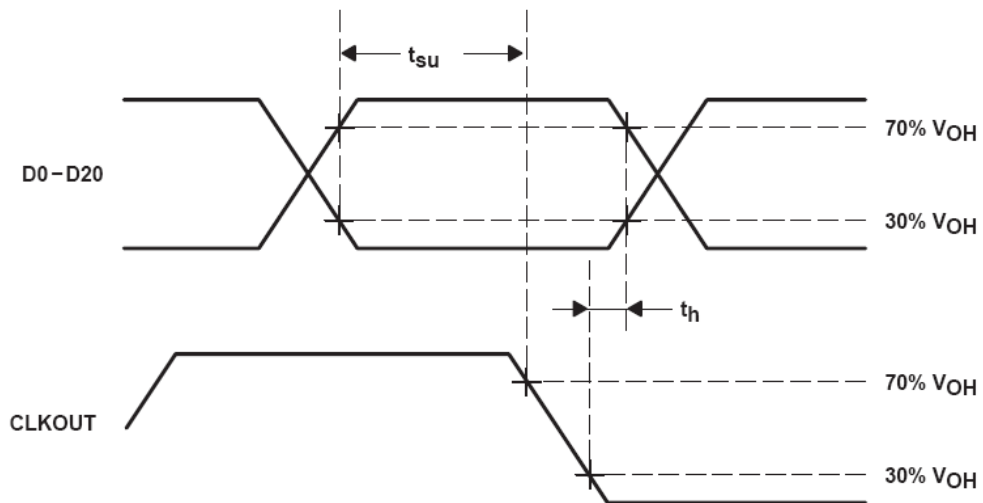


Figure 5. Setup and Hold Time Waveforms

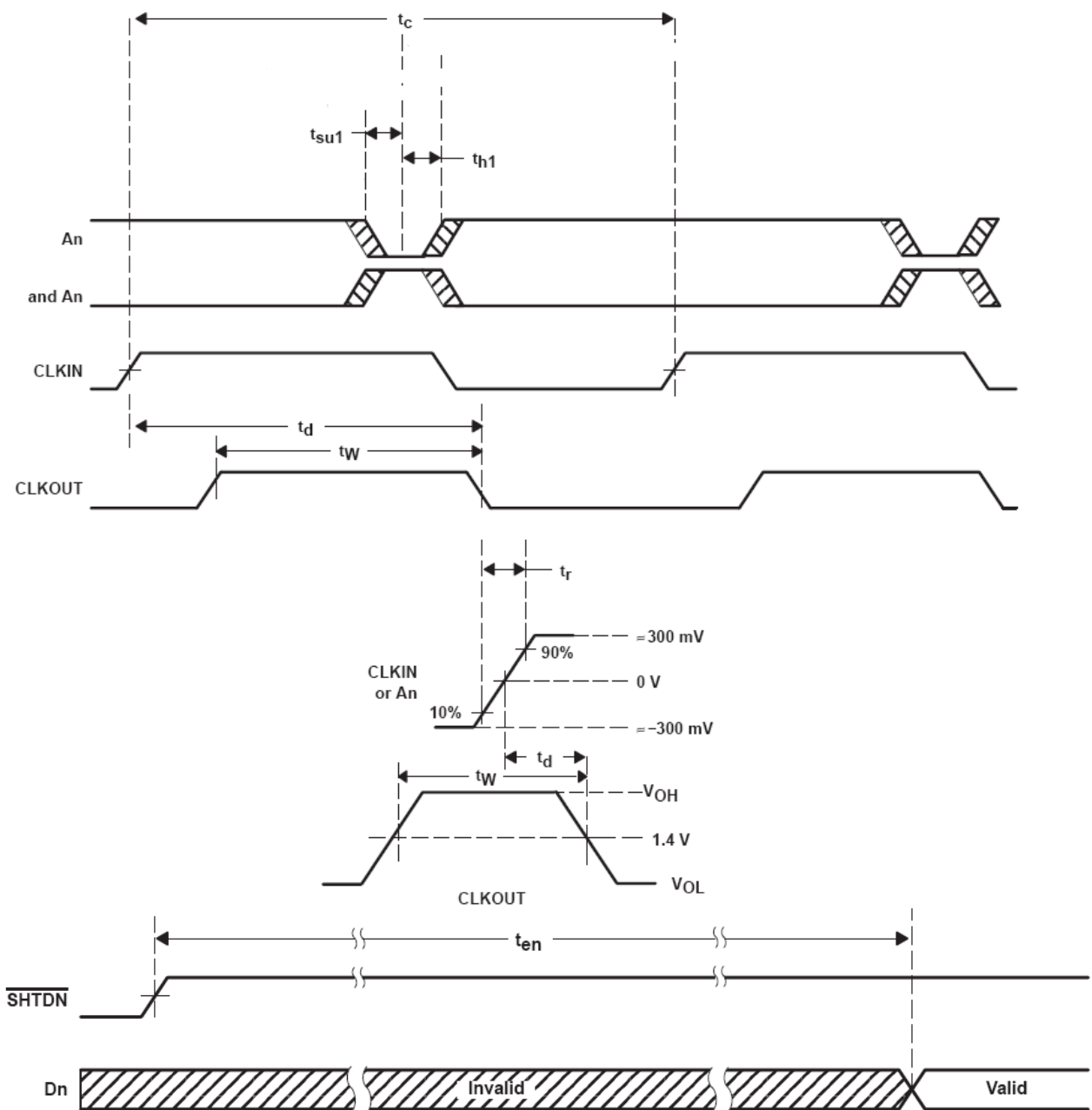


Figure 7. Enable Time Waveforms

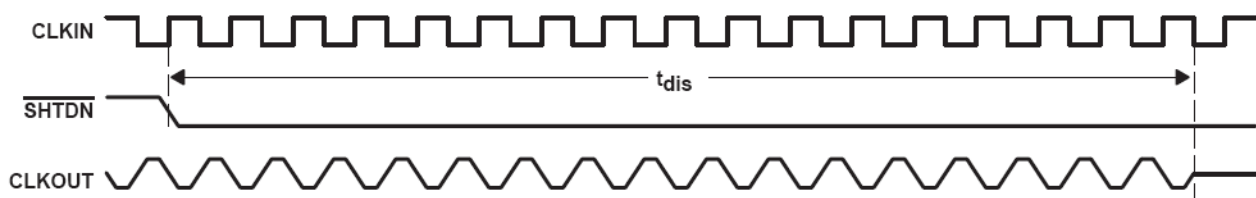
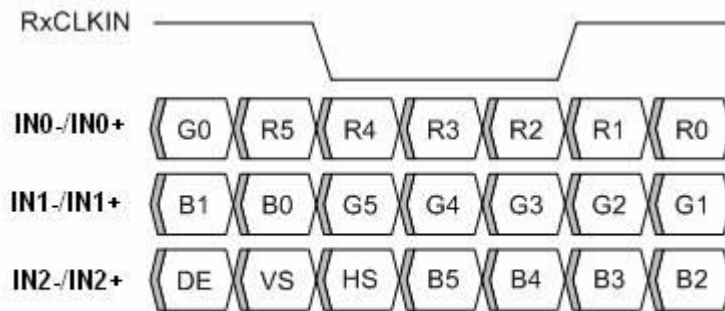


Figure 8. Disable Time Waveforms

## LVDS Input Data Format



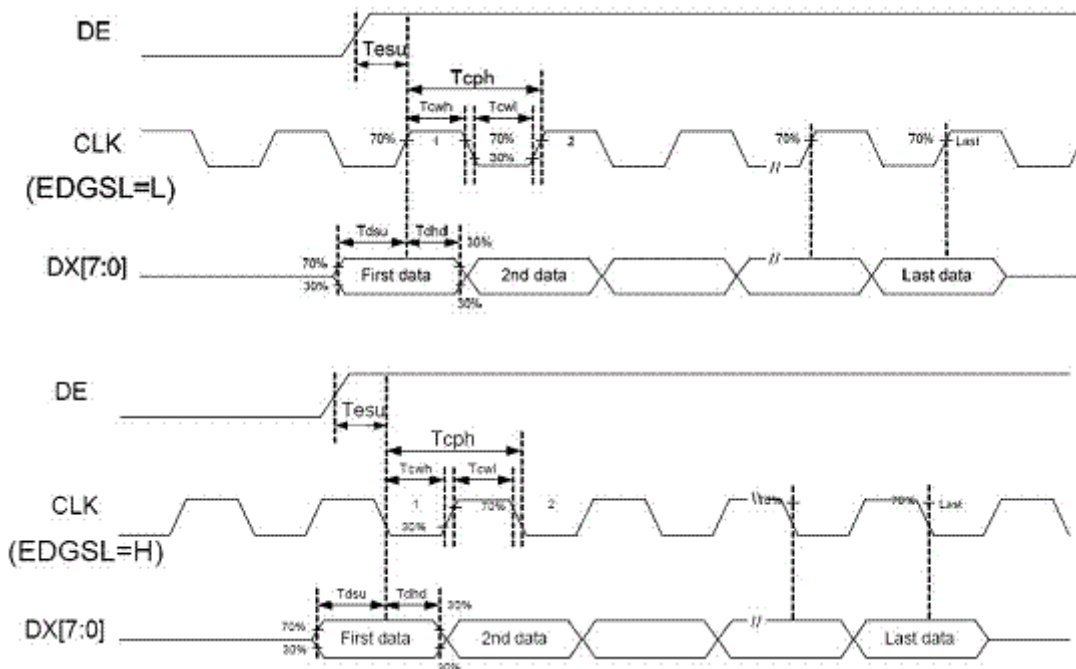
Note : R/G/B data 5 : MSB, R/G/B data 0 : LSB

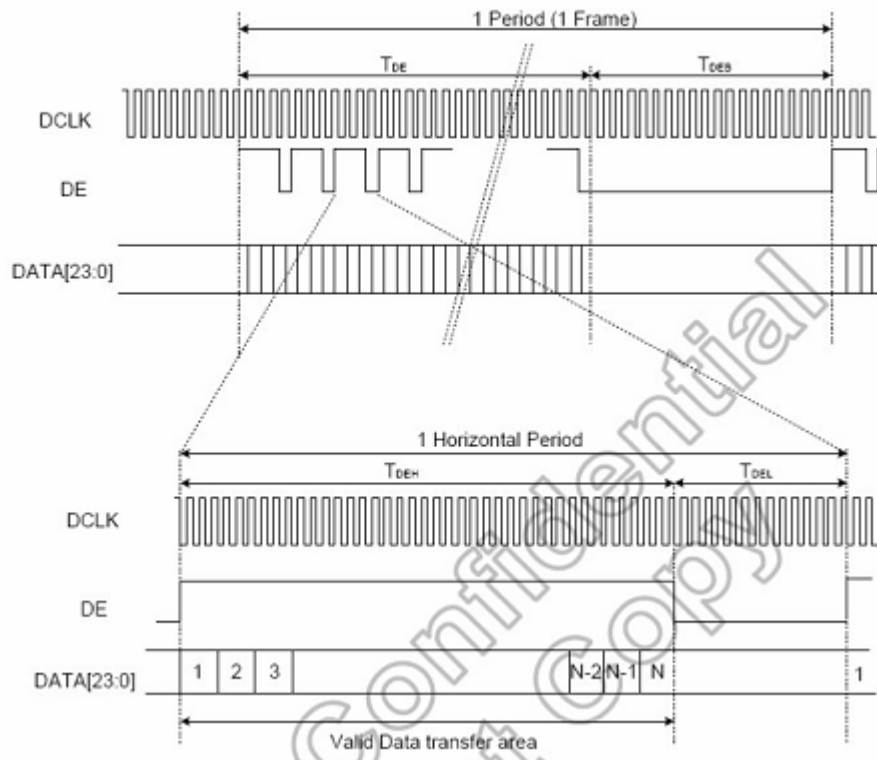
Signal Name	Description	Remark
R5 R4 R3 R2 R1 R0	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
G5 G4 G3 G2 G1 G0	Green Date 5 (MSB) Green Date 4 Green Date 3 Green Date 2 Green Date 1 Green Date 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
B5 B4 B3 B2 B1 B0	Blue Data 5 (MSB) 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 6 bits pixel data.
RxCLKIN+ RxCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

## 8.2 Timing characteristic of Panel

Parameter	Symbol				Unit
		Min.	Typ.	Max.	
Data setup time	Tdsu	6	-	-	ns
Data hold time	Tdhd	6	-	-	Tcph
DE setup time	Tesu	6	-	-	Tcph
CLK frequency	F <sub>CPH</sub>		33.26		MHz
CLK period	T <sub>CPH</sub>		30.06		ns
CLK pulse duty	T <sub>CWH</sub>	40	50	60	%
DE period	T <sub>DEH</sub> +T <sub>DEL</sub>	1000	1056	1200	T <sub>CPH</sub>
DE pulse width	T <sub>DEH</sub>	-	800	-	T <sub>CPH</sub>
DE frame blanking	T <sub>DEB</sub>	10	45	110	T <sub>DEH</sub> +T <sub>DEL</sub>
DE frame width	T <sub>DE</sub>	-	480	-	T <sub>DEH</sub> +T <sub>DEL</sub>

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







## 9. 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
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	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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

## 10. 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 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.

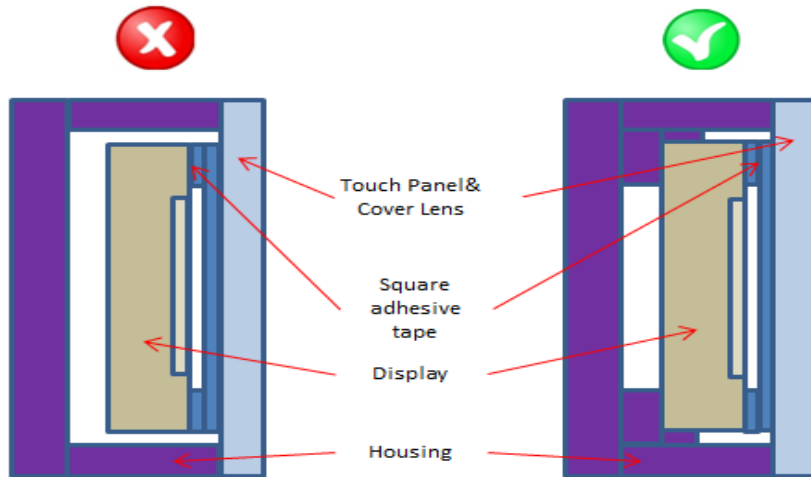
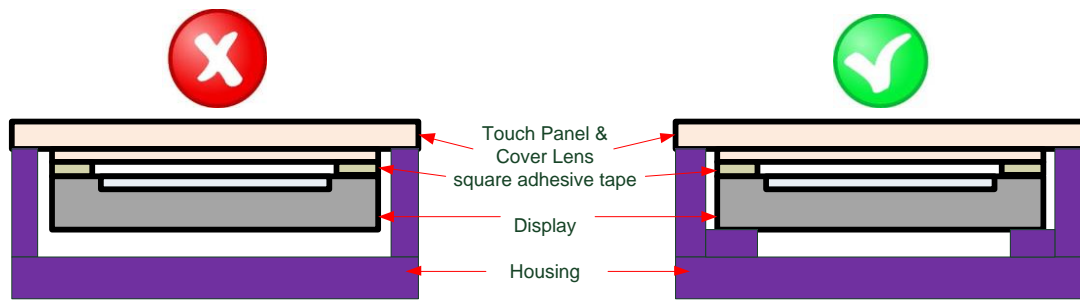
Definitions of life end point:

- 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.

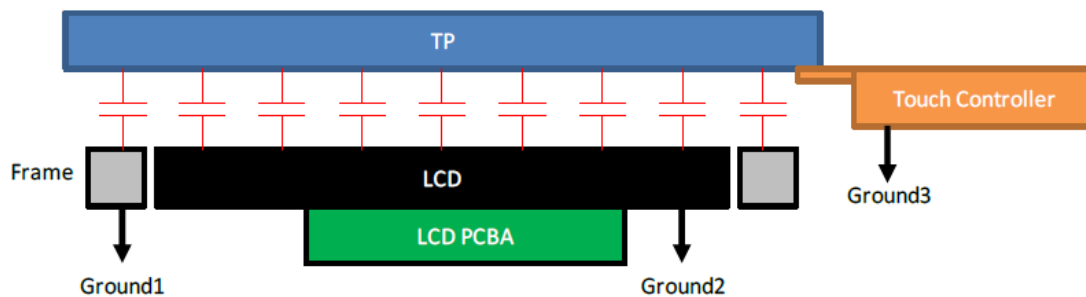
## 11. General Precautions

### 11.1 Handling Precautions

- (1) Display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- (2) If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- (5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
  - Isopropyl alcohol
  - Ethyl alcohol
- (6) Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
  - Water
  - Ketone
  - Aromatic solvents
- (7) Do not attempt to disassemble the LCD Module.
- (8) If the logic circuit power is off, do not apply the input signals.
- (9) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  - a. Be sure to ground the body when handling the LCD Modules.
  - b. Tools required for assembly, such as soldering irons, must be properly ground.
  - c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
  - d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.
- (10) Please hold the LCD module properly when you use or store it.
- (11) 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.



(12) 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

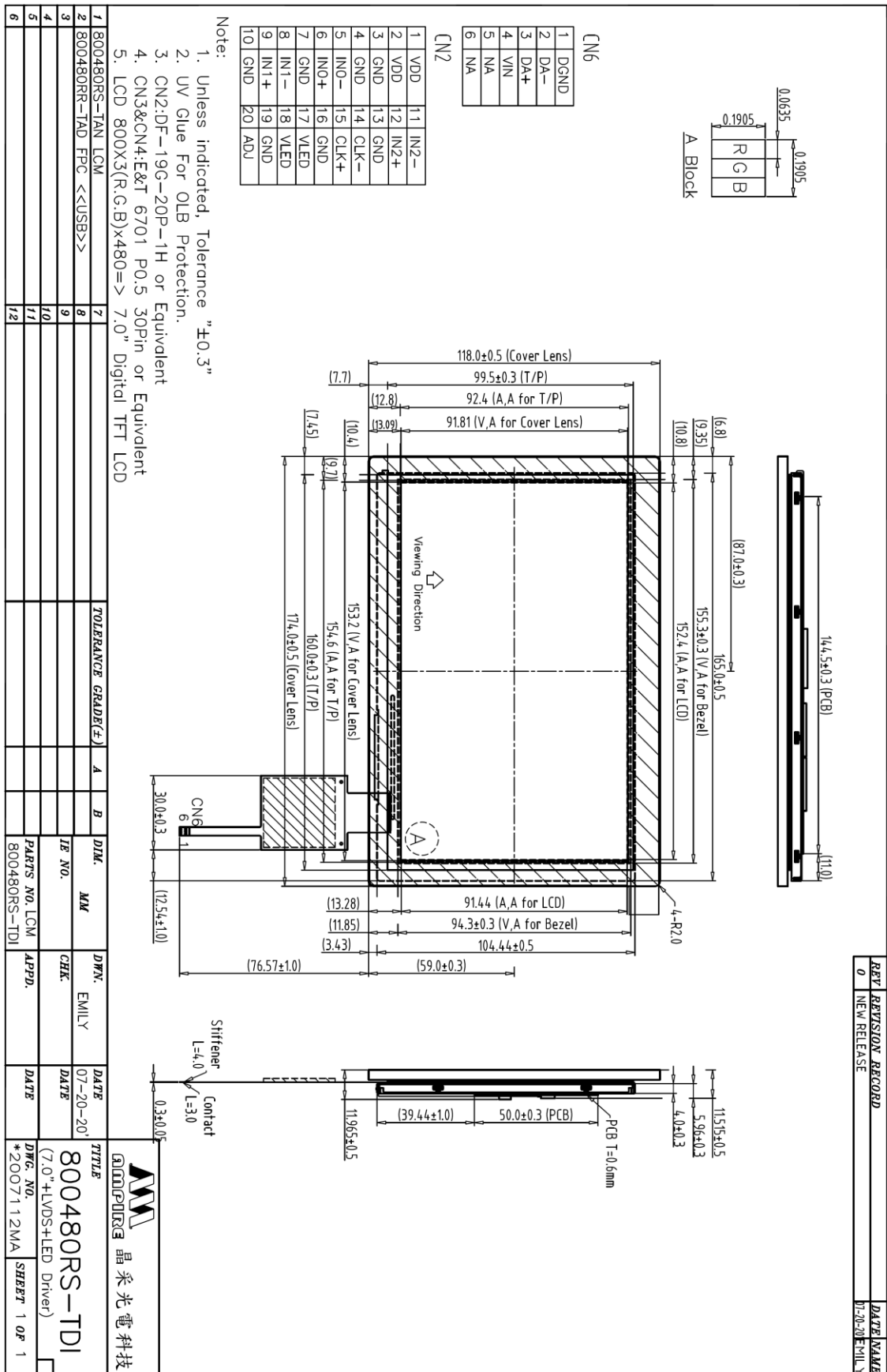
## 11.2 Storage precautions

- (1) When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- (2) The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:  
Temperature: 0°C ~ 40°C  
Relatively humidity: ≤80%
- (3) The LCD modules should be stored in the room without acid, alkali and harmful gas.

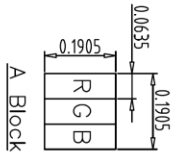
## 11.3 General Precautions

- (1) 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.
- (2) The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

# 12 OUTLINE DIMENSION



REV	REVISION RECORD	DATE NAME
0	NEW RELEASE	17-20-20/EMILY



CN6

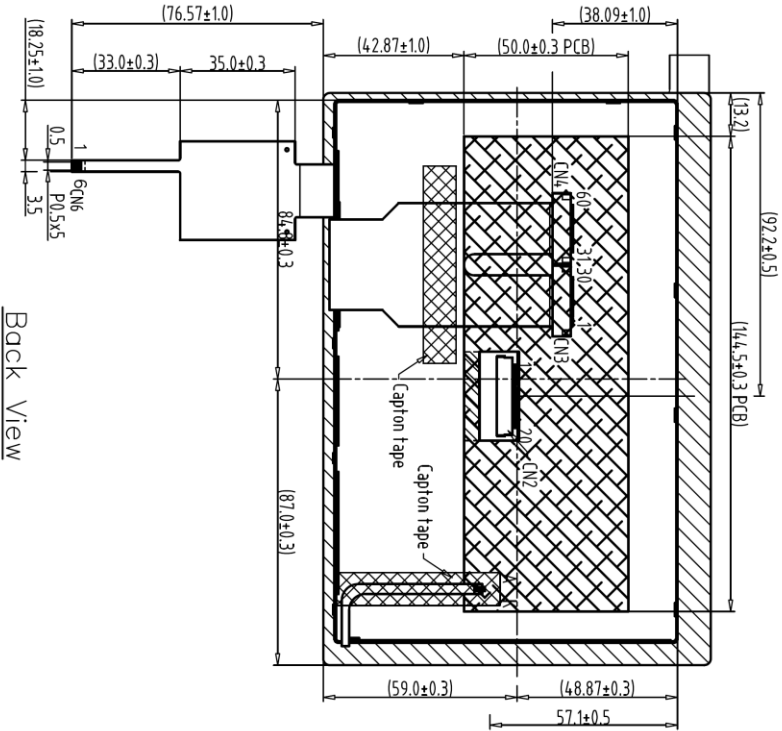
1	DGND
2	DA-
3	DA+
4	VIN
5	NA
6	

CN2

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

Note:

1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN2:DF-19G-20P-1H or Equivalent
4. CN3&CN4:E&T 6701 P0.5 30Pin or Equivalent
5. LCD 800X3(R.G.B)x480=> 7.0" Digital TFT LCD



Back View

1	800480RS-TAN LCM	7																			
2	800480RR-TAD FPC <<USB>>	8																			
3		9																			
4		10																			
5		11																			
6		12																			

AMPRE 晶采光電科技

TITLE	800480RS-TD1	DATE	07-20-20
DWG. NO.	(7.0"+LVDS+LED Driver)	DATE	
*2007113MA		DATE	
SHEET	1 OF 1		