晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-1024768P1TOQW-00H-B
APPROVED BY	
DATE	

☐ Preliminary Specification
☐ Approved Specification

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This Specification is subject to change without notice

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2022/02/14	--	New Release	Mark

1. INTRODUCTION

9.7 inch 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 timing controller IC on TFT Panel, PCBA, White LED Back-light . This TFT LCD has a 9.7ch diagonally measured active display area with 1024 horizontal by 768 vertical pixel array resolutions.

- NEW LCD Driver IC

2. PHYSICAL SPECIFICATIONS

Item	Specifications	Remark
LCD size	9.7 inch(Diagonal)	
Driver element	Active matrix TFT in a-Si technology	
Display resolution	1024 (W) × 3 (RGB) x 768 (H) dots	
Display mode	Normally White, Transmissive	
Gray Scale Inversion	9 o'clock	
Viewing Direction	3 o'clock	
Pixel Pitch	0.192 (W) x0.192 (H) mm	
Active area	196.61 (W) x 147.46 (H) mm	
LCM Outline Dimension	210.2(W) x 166.3(H) x 5.85(D) mm	
Color arrangement	R.G.B-stripe	
Interface	6Bit LVDS	
Color Depth	262K	
LED numbers	36 LEDs	
LED Driver	Without	

3. ABSOLUTE MAX. RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Supply voltage range	VCC	-0.5	5	V	(1)
Voltage range at any terminal	VI	-0.3	VDD + 0.3	V	
Operating Temperature	Top	-20	+70	℃	
Storage Temperature	Tstg	-30	+80	℃	

Note : All voltage values are with respect to the GND terminals unless otherwise noted.

4. ELECTRICAL CHARACTERISTICS

4.1. Power Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Logic Supply Voltage	VCC	3.0	3.3	3.6	V	
VCC Current	ICC	--	(335)	502	mA	(1)
Power Consumption						
Panel + Gamma Circuit			894.3		mW	
LED Back-light			2.304		W	
Total			3.198		W	
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℃ , VCC=3.3V, Display pattern : All Black

4.2. LED BACKLIGHT DRIVER UNIT

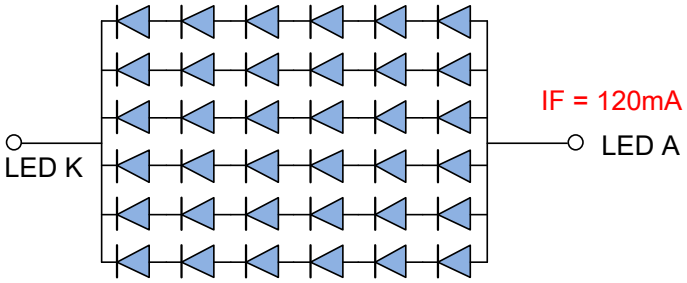
Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	--	120	--	mA	Ta=25℃
LED Forward Voltage	VF	16.8	19.8	21.6	V	IF=120mA, Ta=25℃
LED Life time			30000		Hours	IF=120mA, Ta=25℃

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 structure of LED B/L shows as below.

(36 LEDs 6 LED Serial x 6 LED Parallel)



5. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min	Typ	Max		
Viewing angle (CR≥ 10)	θ_L	θ=180°(9 o'clock)	60	70	-	degree	Note 1
	θ_R	θ=0°(3 o'clock)	50	60	-		
	θ_T	θ=90°(12 o'clock)	60	70	-		
	θ_B	θ=270°(6 o'clock)	60	70	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	15	20	Msec	Note 2 Note 3
	T_{OFF}			5	8		
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_X		0.26	0.311	0.361	-	Note 2 Note 5 Note 6
	W_Y		0.26	0.316	0.366	-	
Luminance	L		600	650		cd/m^2	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7
NTSC	-	-	45	50	-	%	

Test Conditions:

1. VCC=3.3V, IF=120 mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

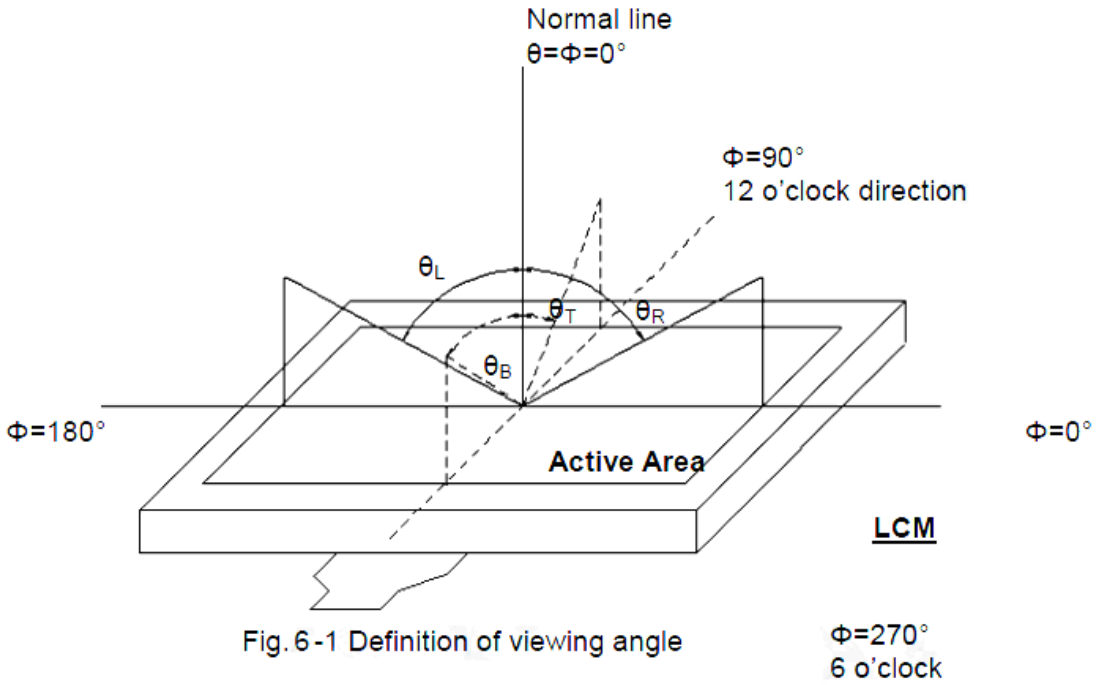


Fig. 6-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.)

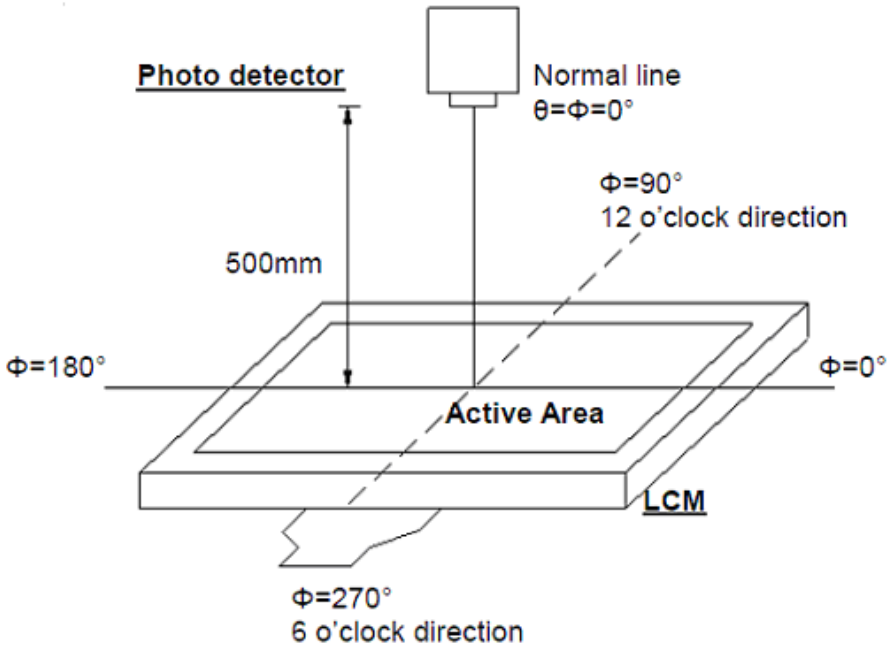


Fig. 6-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

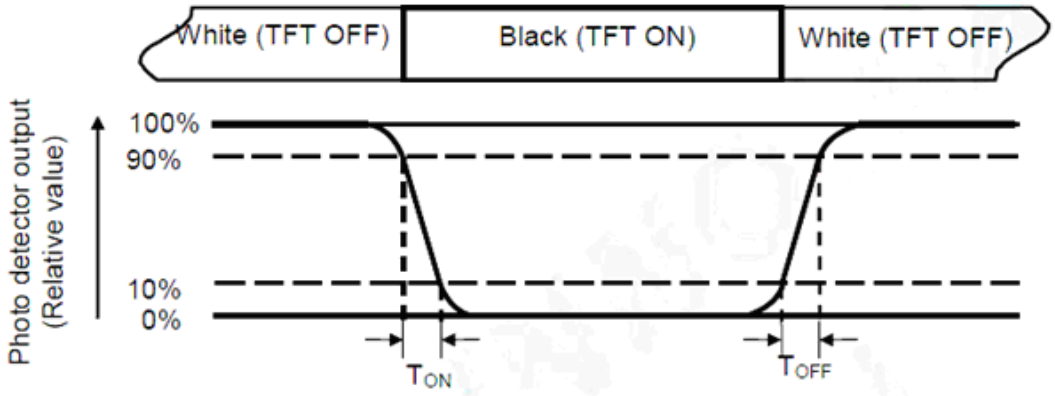


Fig. 6-3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness @ "White" state}}{\text{Brightness @ "Black" state}}$$

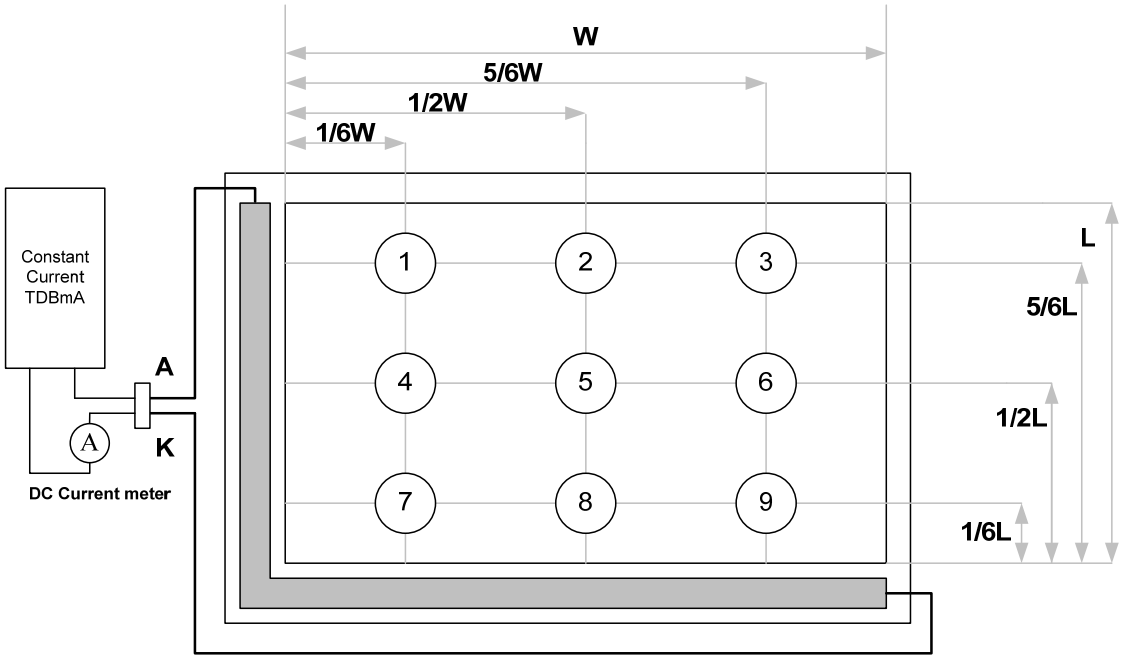
Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=600 mA.

Note 7: Definition of Luminance Uniformity

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$



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

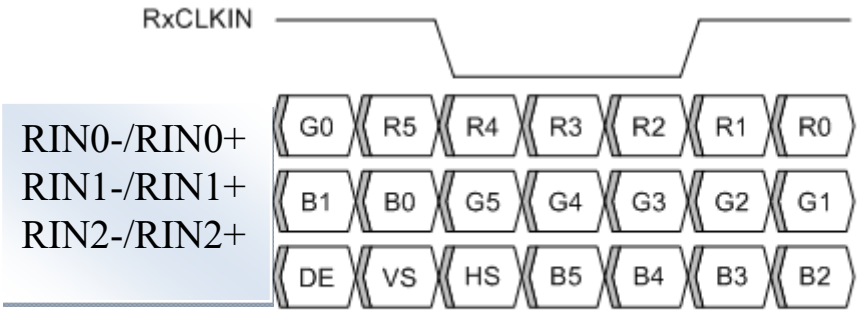
B_{min}: The measured minimum luminance of all measurement position.

6. INTERFACE

6.1. CN1:

Pin No.	Symbol	I/O	Description	Note
1	GND	P	Power ground	
2	VCC	P	Power supply for digital circuit (3.3V)	
3	VCC	P	Power supply for digital circuit (3.3V)	
4	V EDID	P	Power supply for EDID EEPROM	
5	GSP	-	GSP	
6	CLK_EDID		DDC Clock (I2C)	
7	Data_EDID		DDC Data (I2C)	
8	RIN0-	I	LVDS receiver negative signal channel 0	
9	RIN0+	I	LVDS receiver positive signal channel 0	
10	GND	P	Power ground	
11	RIN1-	I	LVDS receiver negative signal channel 1	
12	RIN1+	I	LVDS receiver positive signal channel 1	
13	GND	P	Power ground	
14	RIN2-	I	LVDS receiver negative signal channel 2	
15	RIN2+	I	LVDS receiver positive signal channel 2	
16	GND	P	Power ground	
17	CLKIN-	I	LVDS receiver negative signal clock	
18	CLKIN+	I	LVDS receiver positive signal clock	
19	GND	P	Power ground	
20	NC	-	No connection	
21	VDC	P	LED Anode(Positive)	
22	VDC	P	LED Anode (Positive)	
23	NC	-	No connection	
24	VDC1	P	LED Cathode (Negative)	
25	VDC2	P	LED Cathode (Negative)	
26	VDC3	P	LED Cathode (Negative)	
27	VDC4	P	LED Cathode (Negative)	
28	VDC5	P	LED Cathode (Negative)	
29	VDC6	P	LED Cathode (Negative)	
30	NC	-	No connection	

7. 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. AC Timing characteristic

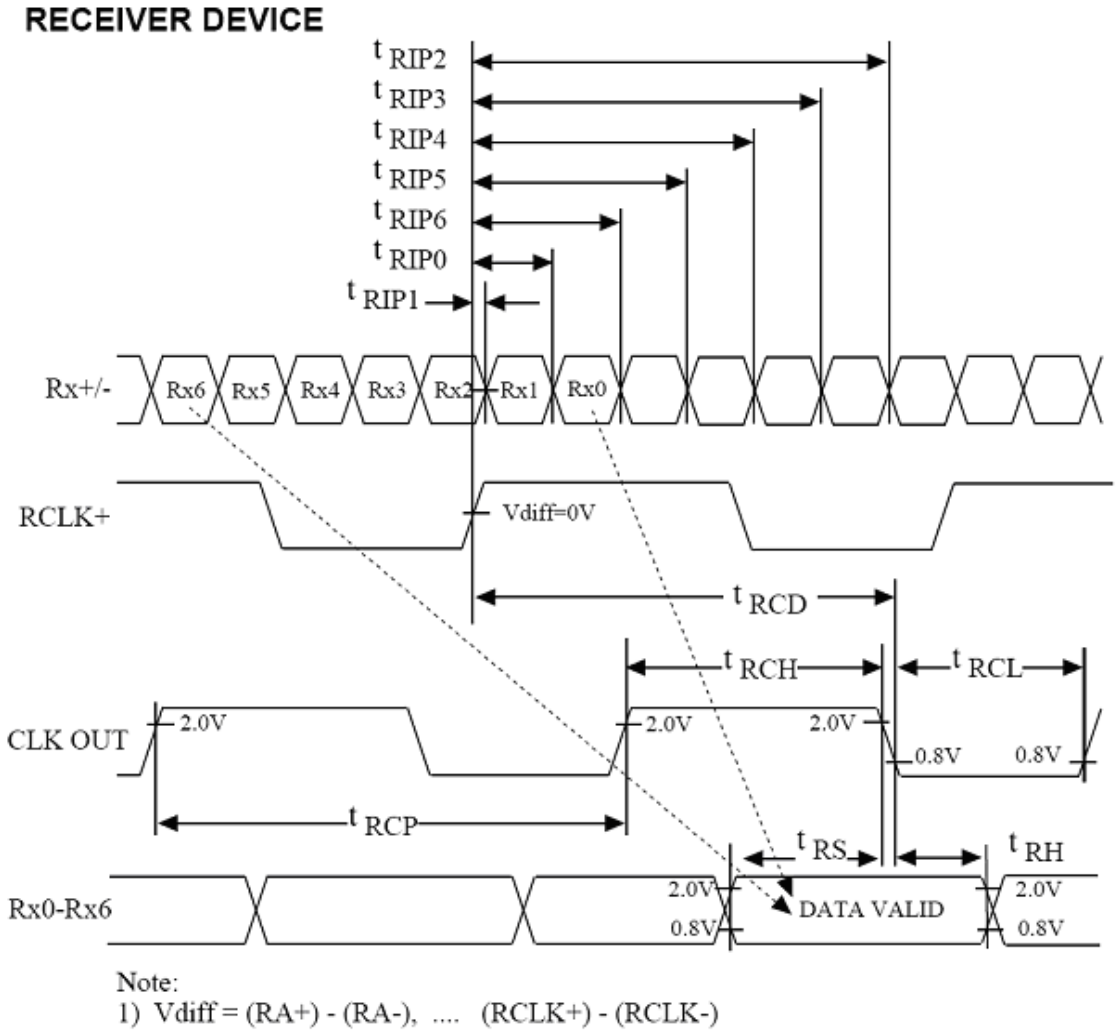
8.1. AC Timing characteristic of LVDS

Switching Characteristics

Vcc = 3.0 - 3.6V, Ta = -10 - +70 ˚C

RECEIVER

t_{RCP}	CLK OUT Period	11.76	T	50.0	ns
t_{RCH}	CLK OUT High Time		4T/7		ns
t_{RCL}	CLK OUT Low Time		3T/7		ns
t_{RCD}	RCLK+/- to CLK OUT Delay		5T/7		ns
t_{RS}	TTL Data Setup to CLK OUT	3T/7-2.5			ns
t_{RH}	TTL Data Hold from CLK OUT	4T/7-3.5			ns
t_{TLH}	TTL Low to High Transition Time		3.0	5.0	ns
t_{THL}	TTL High to Low Transition Time		3.0	5.0	ns
t_{RIP1}	Input Data Position 0 (T=11.76ns)	-0.4	0.0	0.4	ns
t_{RIP0}	Input Data Position 1 (T=11.76ns)	T/7-0.4	T/7	T/7+0.4	ns
t_{RIP6}	Input Data Position 2 (T=11.76ns)	2T/7-0.4	2T/7	2T/7+0.4	ns
t_{RIP5}	Input Data Position 3 (T=11.76ns)	3T/7-0.4	3T/7	3T/7+0.4	ns
t_{RIP4}	Input Data Position 4 (T=11.76ns)	4T/7-0.4	4T/7	4T/7+0.4	ns
t_{RIP3}	Input Data Position 5 (T=11.76ns)	5T/7-0.4	5T/7	5T/7+0.4	ns
t_{RIP2}	Input Data Position 6 (T=11.76ns)	6T/7-0.4	6T/7	6T/7+0.4	ns
t_{RPLL}	Phase Lock Loop Set			10.0	ms

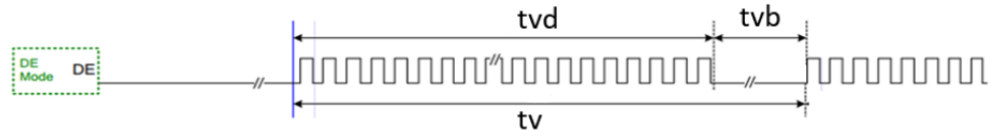


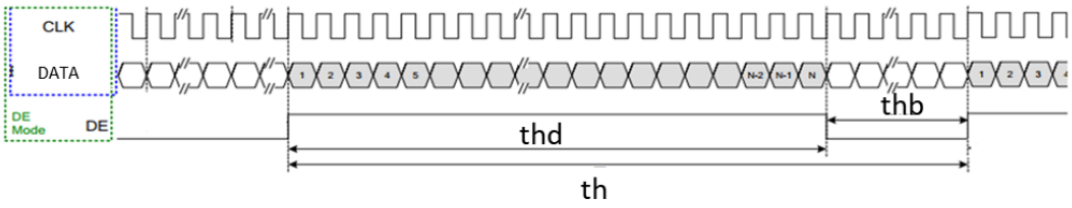
Note:
1) Vdiff = (RA+) - (RA-), ... (RCLK+) - (RCLK-)

8.2. Timing characteristic of Panel

Input Timing Of Connector

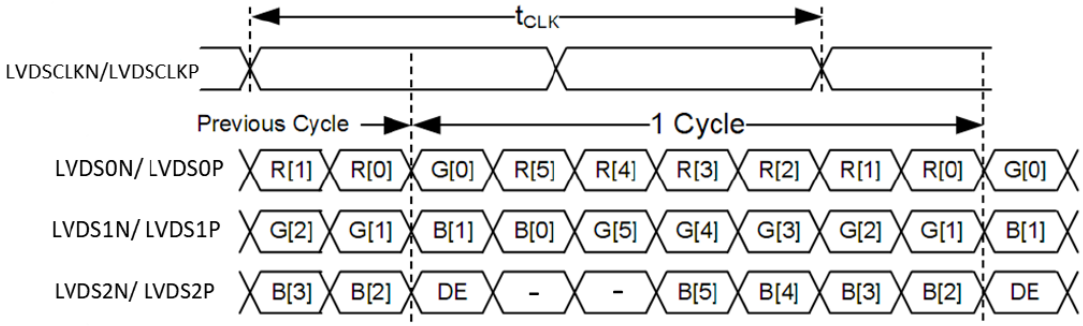
Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	Fclk	53	65	71	MHZ	
Horizontal display area	thd		1024		DCLK	
HSYNC period time	th	1136	1344	1400	DCLK	
HSYNC blanking	thb	112	320	376	DCLK	
Vertical display area	tvd		768		H	
VSYNC period time	tv	778	806	845	H	
VSYNC blanking	tvb	10	38	77	H	



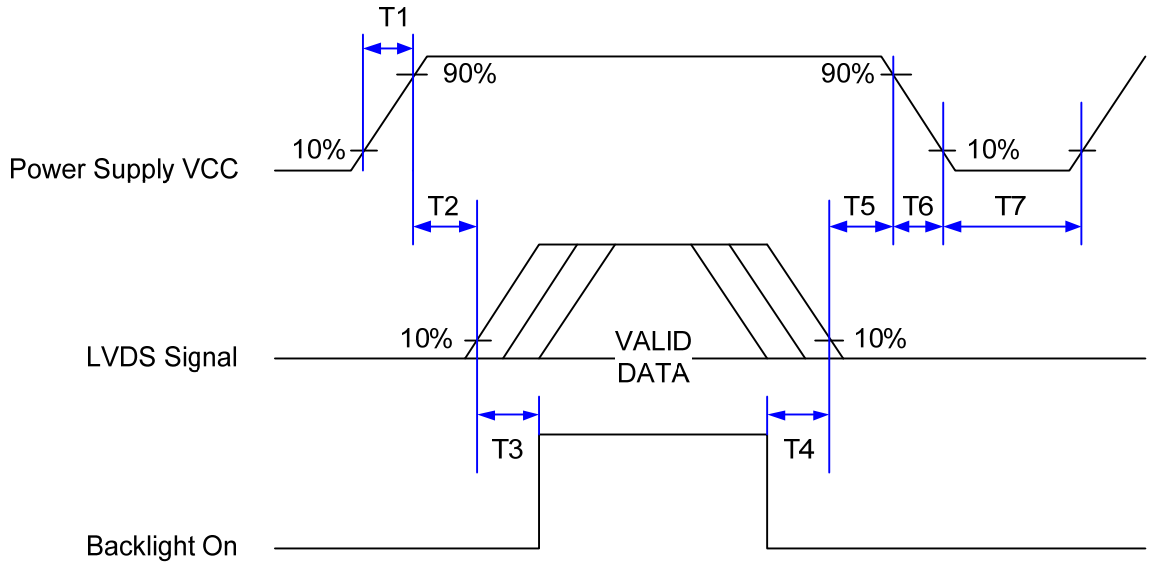


Date input:

6-bit LVDS



8.3. Power ON/OFF Timing



Symbol	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	--	2	us
T2	5	--	50	ms
T3	150	200	--	ms
T4	150	200	--	ms
T5	0	20	30	ms
T6	0.5	--	2	us
T7	1000	--	--	ms

9. ELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C ,Dry t=240 hrs	
Low Temperature Operation	-20±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	-20°C ~ 25°C ~ 70°C 30 m in. 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 : 1.5mm Test direction : X.Y.Z/3 axis Duration : 2 hour/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).

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.

10. Precautions for Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping itfrom a high place, etc.

10.1.2 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.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 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

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

－Water

－Ketone

－Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logiccircuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 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.

10.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 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℃ ～40℃ Relatively humidity: ≤80%

10.2.3The LCD modules should be stored in the room without acid, alkali and harmful gas.

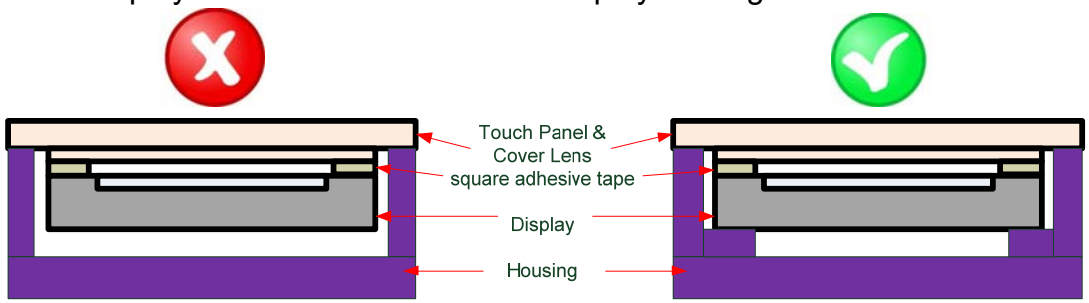
10.3 Transportation Precautions

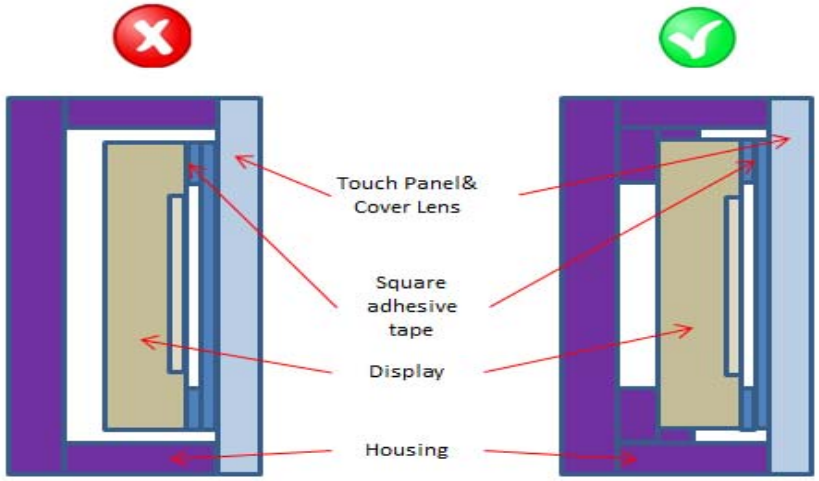
10.3.1The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

10.4 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.





10.5 Others

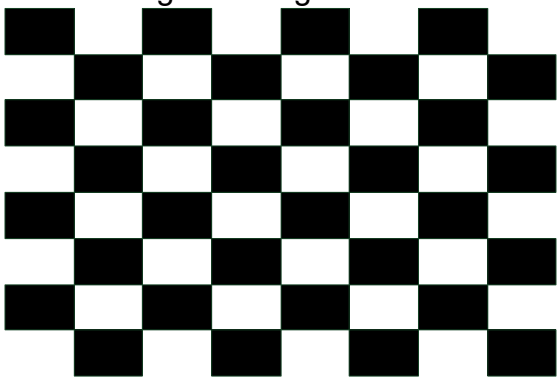
1. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
2. Do not apply fixed pattern data signal to the LCD module at product using.

The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.

Residual image Test Condition:

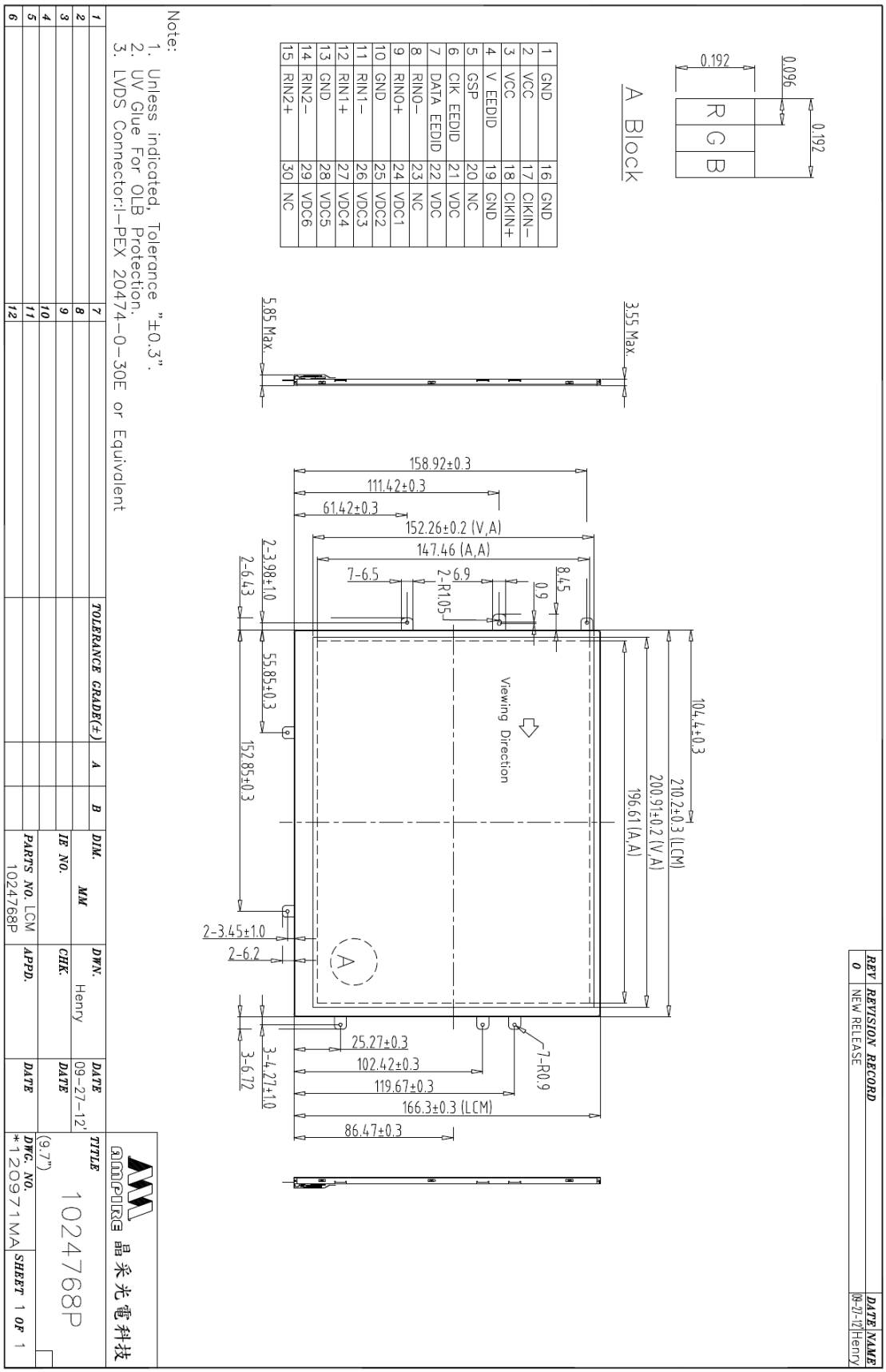
- Ta =25±5℃ RH: 40~75%
- Operation with test patterns sustained for 8 hours, then change to gray pattern immediately. After 30 mins, the image sticking must be disappeared completely.

Image Sticking Test Pattern



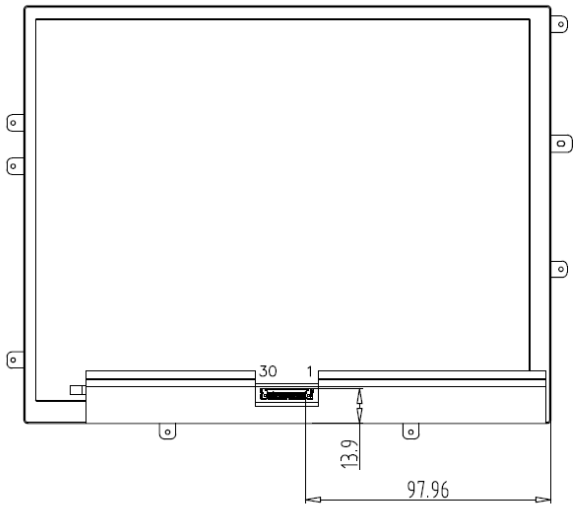
Inspection: Mid Gray Pattern

11. OUTLINE DIMENSION



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	09-27-12'	Henry

1	GND	16	GND
2	VCC	17	CIKIN−
3	VCC	18	CIKIN+
4	V_EEDID	19	GND
5	GSP	20	NC
6	CIK_EEDID	21	VDC
7	DATA_EEDID	22	VDC
8	RIN0−	23	NC
9	RIN0+	24	VDC1
10	GND	25	VDC2
11	RIN1−	26	VDC3
12	RIN1+	27	VDC4
13	GND	28	VDC5
14	RIN2−	29	VDC6
15	RIN2+	30	NC



Back View

Note:
1. Unless indicated, Tolerance "±0.3".
2. UV Glue For OLB Protection.
3. LVDS Connector:I−PEX 20474−0−30E or Equivalent

1		7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. Henry	DATE 09-27-12'	TITLE 1024768P (9.7")
2		8								
3		9					IE NO.	CHK.	DATE	
4		10								
5		11					PARTS NO. LCM-1 1024768P	APPD.	DATE	DWG. NO. *120972MA / SHEET 1 OF 1
6		12								

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