晶采光電科技股份有限公司
AMPIRE CO., LTD.

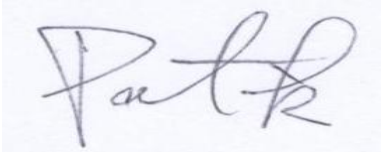
/SIMPLEPLUS Touch Displays

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AMA-150F01-DU2510-G020
APPROVED BY	
DATE	

☑ Approved For Specifications
☐ Approved For Specifications & Sample

AMPIRE CO., LTD.
Building A., 4F., No.116, Sec. 1, Sintai 5th Rd., Xizhi Dist,
New Taipei City 221, Taiwan (R.O.C.)
新北市汐止區新台五路一段 **116** 號 **4** 樓(東方科學園區 **A** 棟)
TEL:886-2-26967269 , FAX:886-2-26967196 or 26967270

APPROVED BY	CHECKED BY	ORGANIZED BY
		

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2018/3/28	-	New Release	Emil
2018/4/2	7	Corrected the value of V_{RP_BL}	Emil

1. Features

This 15” module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit, White-LED Backlight unit and PCAP touch screen with touchscreen controller. Graphics and texts can be displayed on a 1024×RGB×768 dots panel with about 16million colors by using LVDS (Low Voltage Differential Signaling) and supplying +3.3V DC supply voltages for TFT-LCD panel driving and +12.0V DC supply voltage for backlight.

*The TFT-LCD panel used for this module is a high-brightness and high-contrast image.

*The LED driver circuit for backlight is built into the module.

2. Mechanical Specifications

Item	Specifications	Unit
Display size	15 (Diagonal)	inch
Active area	304.1(H) x 228.1(V)	mm
Pixel format	1024(H)×768(V) (1 pixel＝R＋G＋B dot)	pixel
Pixel pitch	0.297(H)×0.297(V)	mm
Color arrangement	R.G.B-stripe	-
Display mode	Normally Black	-
Interface of TFT panel	LVDS	-
Interface of touch screen	USB	-
Thickness of cover glass	2	mm

3. ABSOLUTE MAXIMUM RATINGS

GND=0V, T_A=25℃

Item	Symbol	Values		Unit	Pin	Remark
		MIN	MAX			
Supply voltage	V_{CC}	-0.3	4.0	V	V_{CC}	Note1,2
Supply voltage	V_{LED}	-0.3	15	V	V_{LED}	
Supply voltage	V_{DD}	-0.3	6	V	V_{DD}	
Input voltage	V_{I1}	-0.3	+V_{CC}+0.3	V	RxIN0-/+,RxIN1-/+ RxIN2-/+, RxIN3-/+	
	V_{I2}	-0.3	+V_{CC}+0.3	V	CK IN-/+	
	V_{I3}	-0.3	+V_{CC}+0.3	V	RL/UD, SELLVDS	
	V_{I4}	-0.3	+V_{DD}	V	XSTABY, VBR	
Storage Temperature	T_{st}	-25	70	℃	-	Note1,
Operation Temperature	T_{op}	-20	70	℃	-	Note1,4

Note 1:

Humidity：95%RH Max.(Ta≦40℃) Note static electricity.

Maximum wet-bulb temperature at 39℃ or less. (Ta>40℃), No condensation.

Note 2:

The V_{CC} power supply capacity must use the one of 2.5A or more.

The V_{LED} power supply capacity must use the one of 5A or more.

There is a possibility of causing smoking and the ignition without fusion of LCD fuse when abnormality occurs when the current capacity is smaller than regulated values.

Please install the protection function in which the over current and the excess voltage are controlled to the set side when you design the lower current supply.

Note 3:

There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at -20～0℃, 60～70℃.

There is a possibility of causing the fineness deterioration by the prolonged use in the (high temperature) humidity environment (60% or more).

Note 4:

In the operating temperature item, the low temperature side is the ambient temperature regulations.

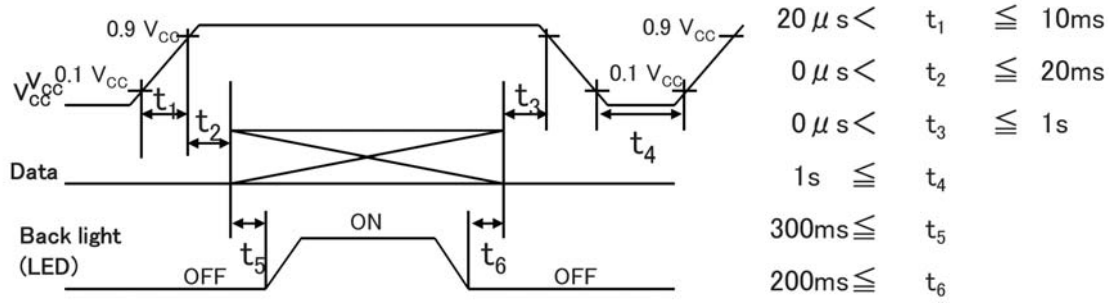
The high temperature side is the panel surface temperature regulations.

4. Electrical Characteristics

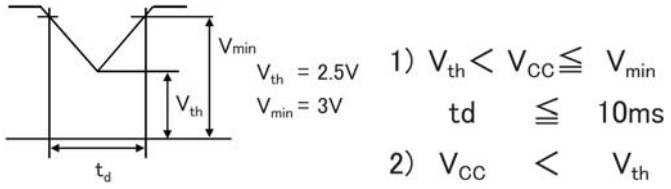
4.1 TFT-LCD panel driving

Item		Symbol	Min	Typ	Max	Unit	Note
Supply voltage		V_{CC}	3	3.3	3.6	V	Note1
Current dissipation		I_{CC}	-	380	500	mA	Note2 V_{CC}=3.3V
Input voltage for LVDS receiver		V_L	0	-	2.4	V	
Permissive input ripple voltage		V_{RP}	-	-	200	mV_{p-p}	V_{CC}=3.3V
Differential input threshold voltage	High	V_{TH}	-	-	V_{CM}+100	mV	V_{CM} =+1.2V Note3
	Low	V_{TL}	V_{CM}-100	-	-	mV	
Input voltage		V_{IH}	2.1	-	-	V	Note4
		V_{IL}	-	-	0.8	V	
Input leak current		I_{OH}	-	-	400	uA	V_{I2}=0V Note4
		I_{OL}	-10	-	10	uA	V_{I2}=0V Note4
Terminal resistor		R_T	-	100	-	ohm	Differential input

Note1. V_{CC} turn-on/off conditions



V_{CC} -dip conditions



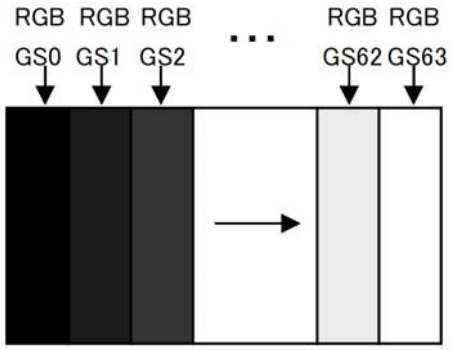
V_{CC} -dip conditions should also follow the On-off conditions for supply voltage

The relation between the data input and the backlight lighting will recommend the above-mentioned input sequence. When the backlight is turned on before the panel operates, there is a possibility of abnormally displaying. The liquid crystal module is not damaged.

Note2. Current dissipation

Typical current situation: 64-gray-bar pattern

Condition VCC=+3.3V, fck=65MHz, Ta=25℃



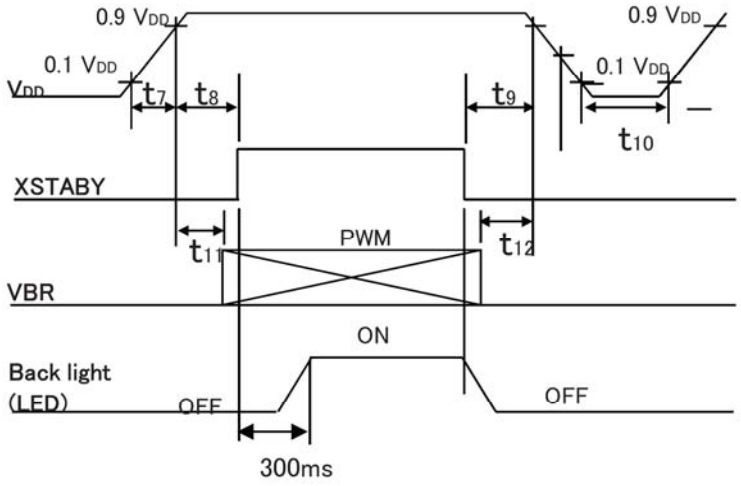
Note3. V_{CM}: LVDS common mode voltage.

Note4. RL/UD, SELLVDS.

4-2 Backlight driving Section

Item		Symbol	Min	Typ	Max	Unit	Note
Supply voltage		V_{LED}	10.2	12	13.8	V	Note1
Current dissipation		I_{LED1}	-	730	1100	mA	Note2
		I_{LED2}	-	-	10	uA	
Permissive input ripple voltage		V_{RP_BL}	-	-	200	mV_{p-p}	V_{LED}=+12V
BL_EN	High voltage	V_{IH_BLEN}	2.4	-	V_{LED}	mV	Note3 Note4
	Low voltage	V_{IL_BLEN}	-	-	0.2	mV	
PWM	High voltage	V_{IH_PWM}	2.1	-	V_{LED}	V	Note3
	Low voltage	V_{IL_PWM}	-	-	0.8	V	
PWM frequency		F_{PWM}	50	-	1K	Hz	Note3 Note5
PWM duty ratio		D_{PWM}	1	-	100	%	
Life time		L	-	70,000 (Module)	-	Hrs	Reference Note6 Note7
LED life time		L_{LED}	50,000	-	-	Hrs	Note6 Note7

Note1. On-off conditions for supply voltage



20 μs≦ t7 ≦ 200ms
0 ms≦ t8
0 ms≦ t9
200 ms≦ t10
10 ms≦ t11
0 ms≦ t12

Note2. Current dissipation

Typ. Value: V_{LED}=+12.0V、PWM Duty=100%

Max. value: V_{LED}=+10.2V、PWM Duty=100%

Note3. This terminal is connected to a 10K ohm pull-down resistor.

Note4.

High: Backlight ON

Low: Backlight OFF

.

Note5.

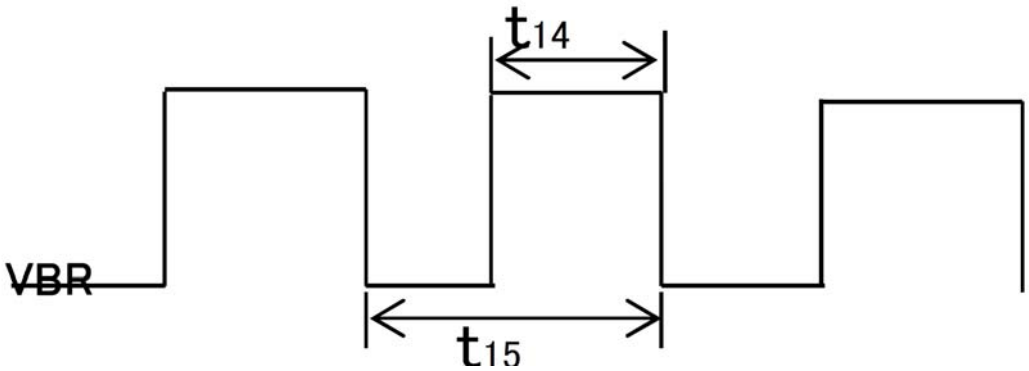
f_{PWM}=1/t15

Duty 1%: Min. Luminance

Duty 100%: Max. Luminance

Luminance changes in proportion to the duty ratio. (t14≧200μs)

When the frequency slows, the display fineness might decrease.



Note6.

Luminance becomes 50% of an initial value. (Ta＝25℃, PWM=100%)

Note7.

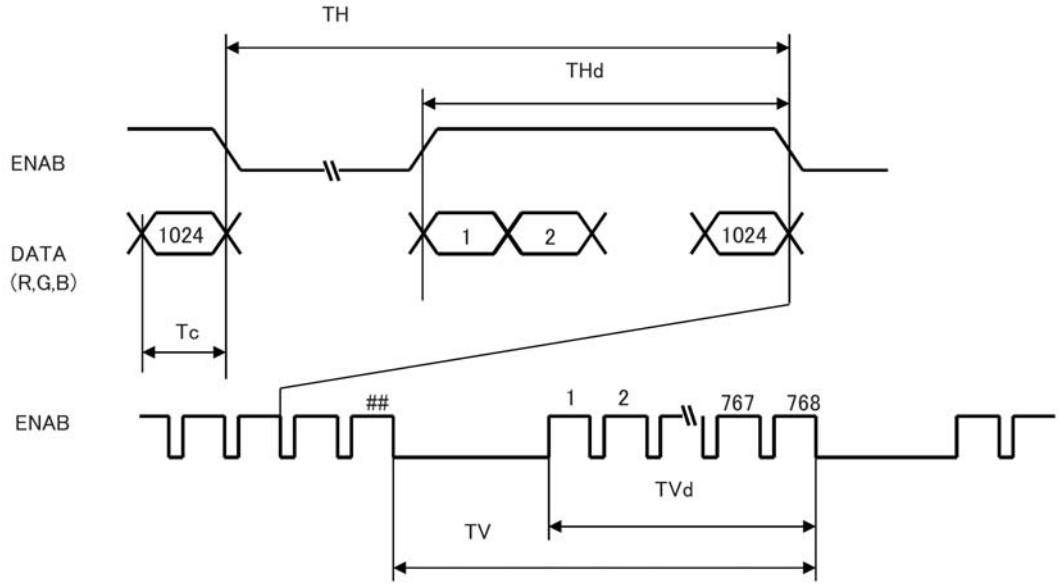
The LED used in this LCD module is very sensitive to temperature change. If it operates for extremely long time under high temperature, it is possible rapidly to shorten the life time of LED. In case of such a condition, consult with us.

5 Timing Characteristics of Input Signals

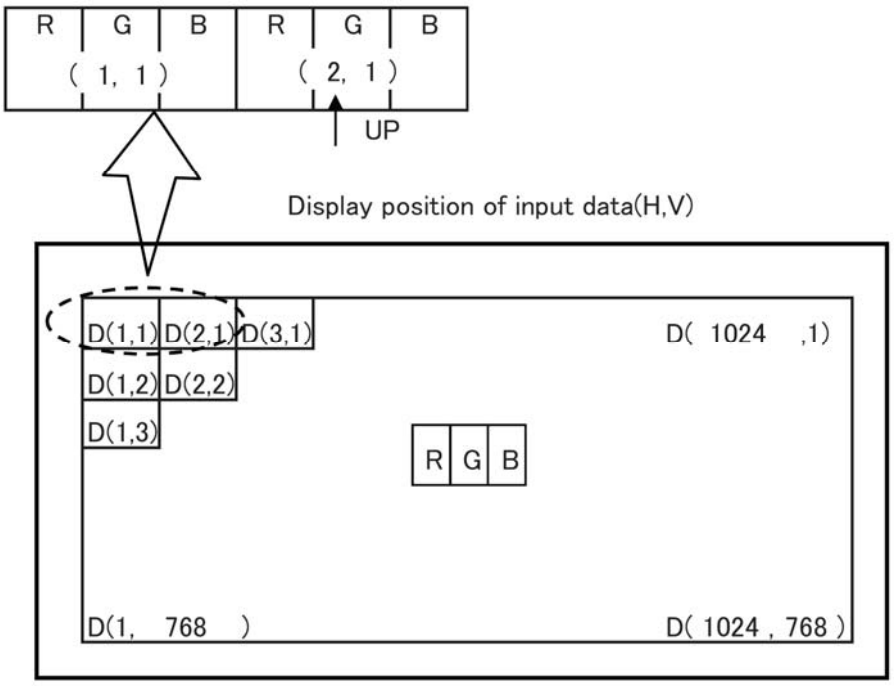
5.1Timing characteristics

Parameter		Symbol	Min	Typ	Max	Unit	Note
Clock	Frequency	$1/T_C$	50	65	80	MHz	
ENB	Horizontal period	TH	1094	1344	1720	clock	
			16	20.7	26.4	us	
	Horizontal display period	THd	1024	1024	1024	clock	
	Vertical period	TV	776	806	990	line	Note1
			13.3	16.7	20.5	ms	
	Vertical display period	TVd	768	768	738	line	

Note1. In case of using the long vertical period, the deterioration of display quality, flicker etc. may occur.



5.2 Input Data Signals and Display Position on the screen



6. INTERFACE

6.1 TFT-LCD Panel driving

CN1

Using connector: DF14H-20P-1.25H（56）(Hirose Electric Co.,Ltd.)

Corresponding connector : DF14-20S-1.25C（connector）(Hirose Electric Co.,Ltd.)

:DF14-2628SCFA（terminal）(Hirose Electric Co.,Ltd.)

Using LVDS receiver:

Building into control IC (THC63LVDF84B (Thine electronics) compatible product)

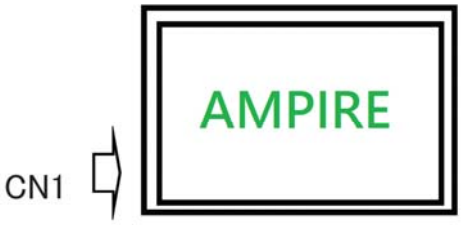
Corresponding LVDS transmitter:

THC63LVDM83R (Thine electronics) or Compatible product.

Pin	Symbol	Function	Remarks
1	V_{CC}	+3.3V Power supply	
2	V_{CC}	+3.3V Power supply	
3	GND	GND	
4	GND	GND	
5	RxIN0-	LVDS receiver signal CH0 (-)	LVDS
6	RxIN0+	LVDS receiver signal CH0 (+)	LVDS
7	GND	GND	
8	RxIN1-	LVDS receiver signal CH1 (-)	LVDS
9	RxIN1+	LVDS receiver signal CH1 (+)	LVDS
10	GND	GND	
11	RxIN2-	LVDS receiver signal CH2 (-)	LVDS
12	RxIN2+	LVDS receiver signal CH2 (+)	LVDS
13	GND	GND	
14	CK IN0-	LVDS receiver signal CK (-)	LVDS
15	CK IN0+	LVDS receiver signal CK (+)	LVDS
16	GND	GND	
17	RxIN3-	LVDS receiver signal CH3 (-)	LVDS
18	RxIN3+	LVDS receiver signal CH3 (+)	LVDS
19	RL/UD	Horizontal/Vertical display mode select signal	Note1
20	SELLVDS	LVDS SET	Note2

Note1:

RL/UD = L(GND) or Open



RL/UD = H(3.3V)

Note 2: SELLVDS is shown in 6.2.

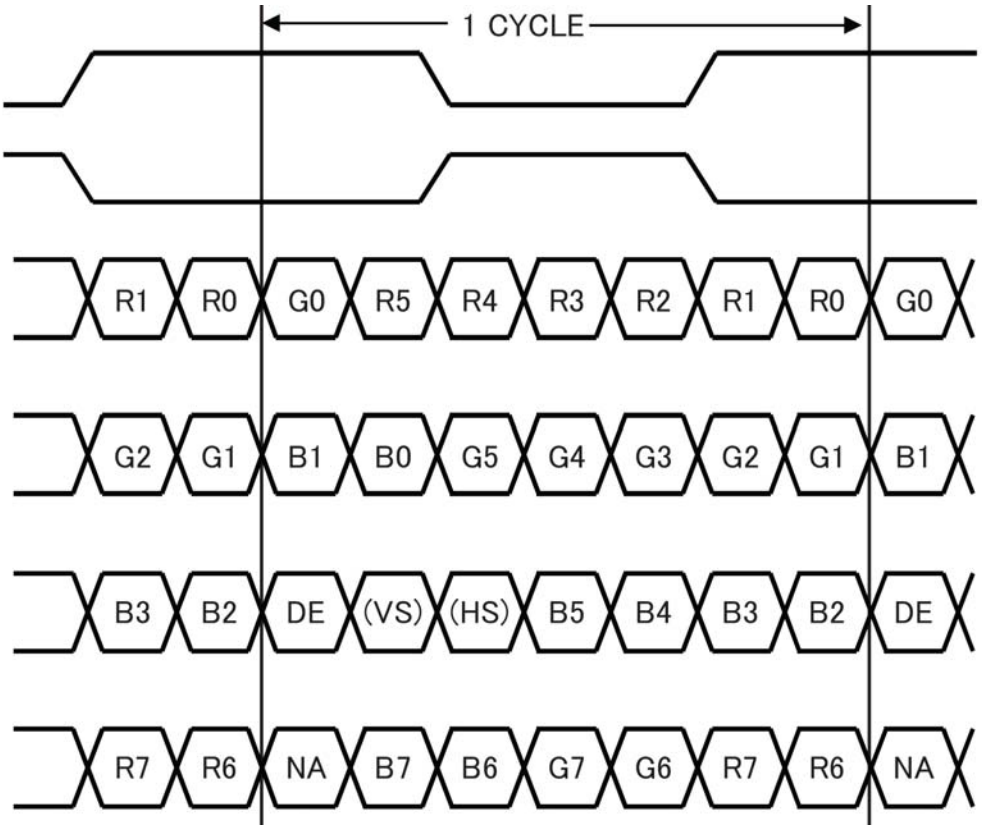
6.2 Data Mapping

1) 8 bit input

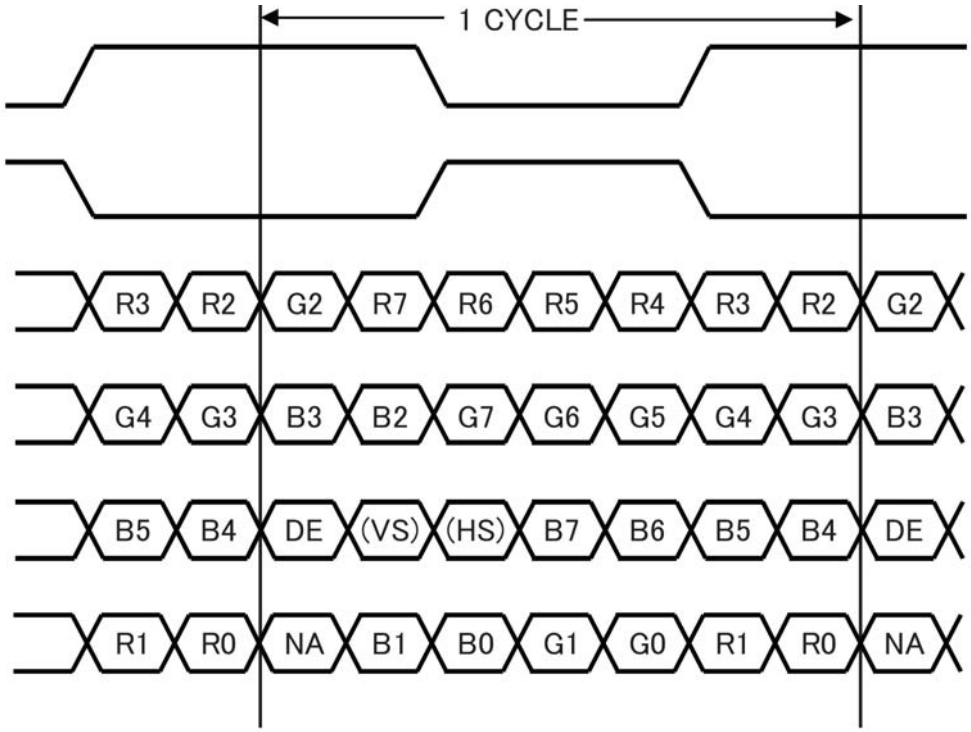
Note 1: pin assignment with SELLVDS pin (THC63LVDM83R (Thine electronics) or Compatible product)

Transmitter		20Pin SELLVDS	
Pin No	Data	= L(GND) or Open	= H(3.3V)
51	TA0	R0 (LSB)	R2
52	TA1	R1	R3
54	TA2	R2	R4
55	TA3	R3	R5
56	TA4	R4	R6
3	TA5	R5	R7 (MSB)
4	TA6	G0 (LSB)	G2
6	TB0	G1	G3
7	TB1	G2	G4
11	TB2	G3	G5
12	TB3	G4	G6
14	TB4	G5	G7 (MSB)
15	TB5	B0 (LSB)	B2
19	TB6	B1	B3
20	TC0	B2	B4
22	TC1	B3	B5
23	TC2	B4	B6
24	TC3	B5	B7 (MSB)
27	TC4	(HS)	(HS)
28	TC5	(VS)	(VS)
30	TC6	DE	DE
50	TD0	R6	R0 (LSB)
2	TD1	R7 (MSB)	R1
8	TD2	G6	G0 (LSB)
10	TD3	G7 (MSB)	G1
16	TD4	B6	B0 (LSB)
18	TD5	B7 (MSB)	B1
25	TD6	(NA)	(NA)

(SELLVDS = L(GND) or Open)



(SELLVDS = H(3.3V))



DE : DATA ENABLE

HS : Hsync

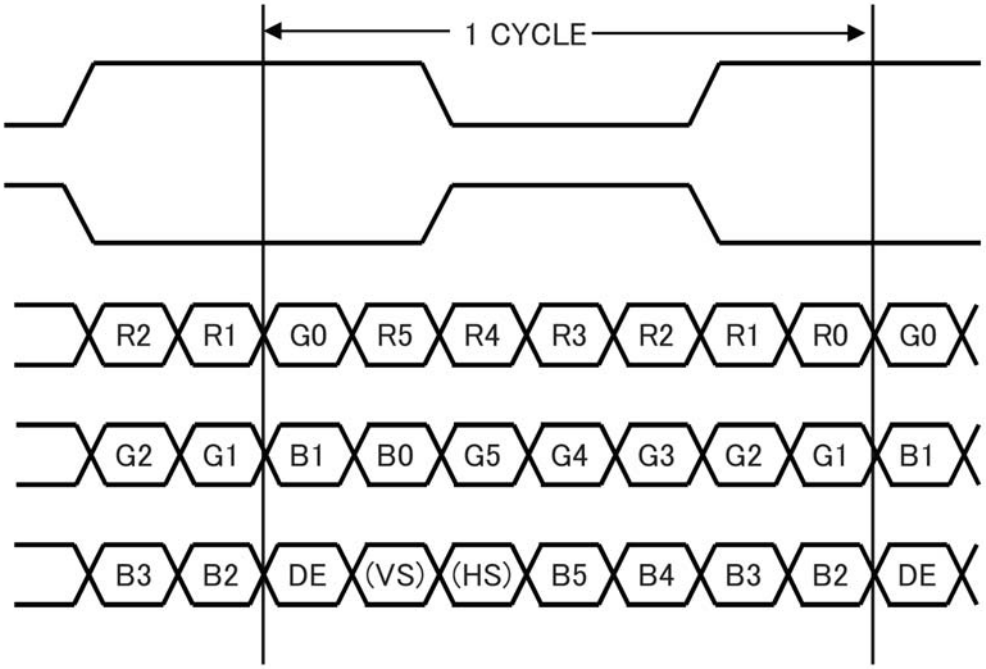
VS : Vsync

2) 6 bit input

Note 1: pin assignment with SELLVDS pin (THC63LVDM83R (Thine electronics) or Compatible product)

Transmitter		20Pin SELLVDS	
Pin No	Data	HIGH	
51	TA0	–	R0 (LSB)
52	TA1	–	R1
54	TA2	–	R2
55	TA3	–	R3
56	TA4	–	R4
3	TA5	–	R5 (MSB)
4	TA6	–	G0 (LSB)
6	TB0	–	G1
7	TB1	–	G2
11	TB2	–	G3
12	TB3	–	G4
14	TB4	–	G5 (MSB)
15	TB5	–	B0 (LSB)
19	TB6	–	B1
20	TC0	–	B2
22	TC1	–	B3
23	TC2	–	B4
24	TC3	–	B5 (MSB)
27	TC4	–	(HS)
28	TC5	–	(VS)
30	TC6	–	DE
50	TD0	–	GND
2	TD1	–	GND
8	TD2	–	GND
10	TD3	–	GND
16	TD4	–	GND
18	TD5	–	GND
25	TD6	–	(NA)

(SELLVDS = H(3.3V))

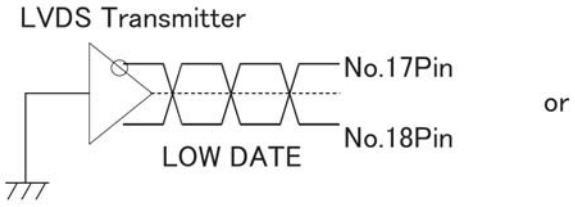


DE : DATA ENABLE

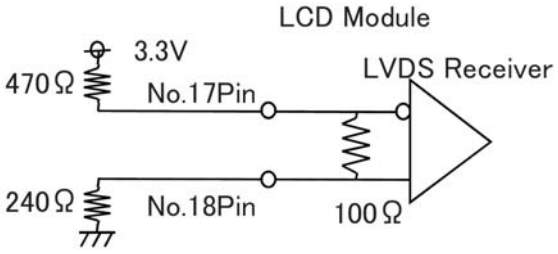
HS : Hsync

VS : Vsync

Recommended input （17pin, 18pin at 6bit ）



or



6.3 LED backlight

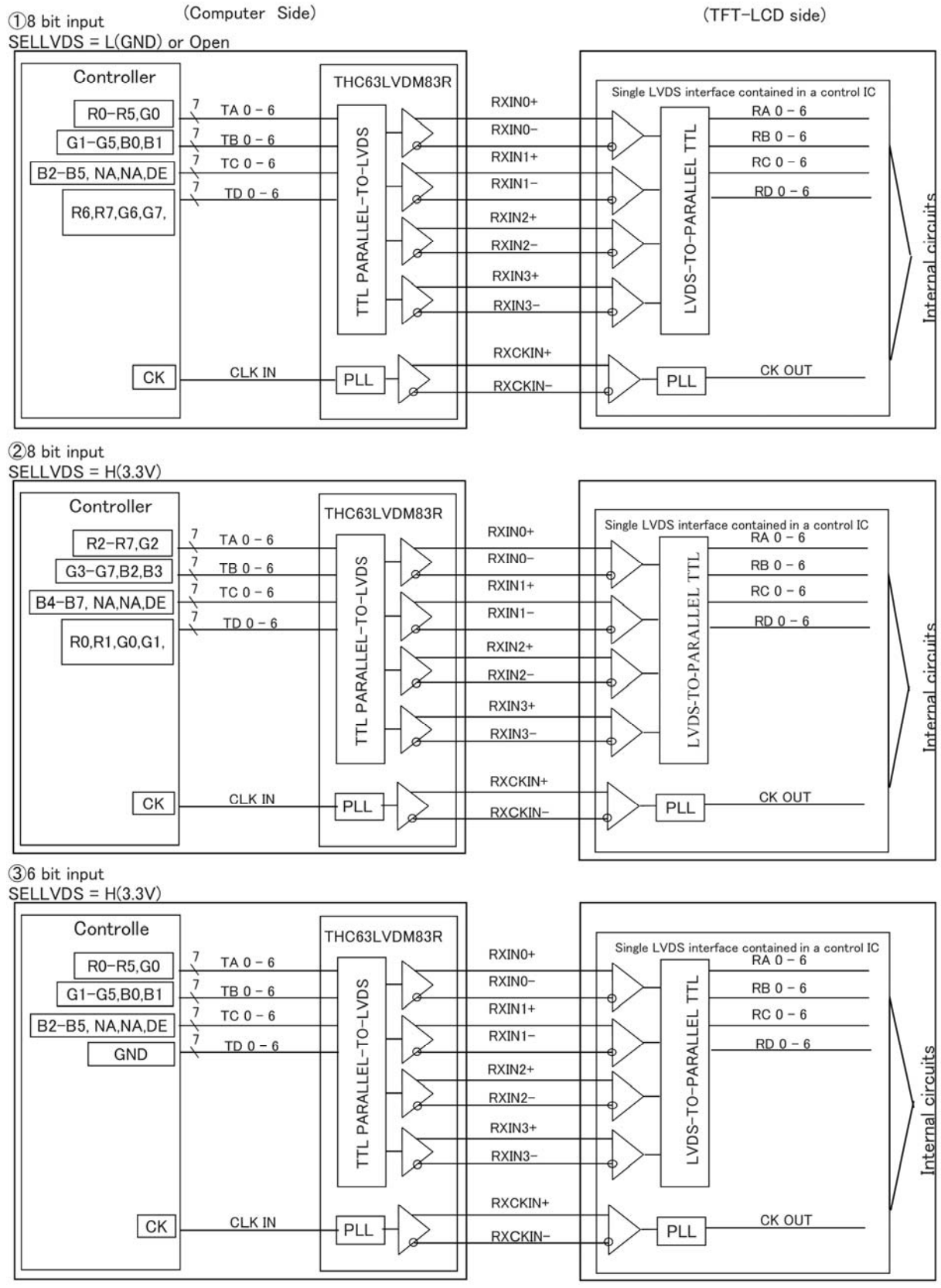
LED backlight connector

CN2 Used connector: SM06B-SHLS-TF (J.S.T. Mfg. Co. Ltd)

Corresponding connector: SHLP-06V-S-B (J.S.T. Mfg. Co. Ltd)

Pin	Symbol	Function
1	V_{LED}	+12V Power supply
2	V_{LED}	+12V Power supply
3	GND	GND
4	GND	GND
5	XSTABY	ON/OFF control signal for backlight
6	VBR	PWM signal for backlight dimming

6.4 LVDS interface block diagram

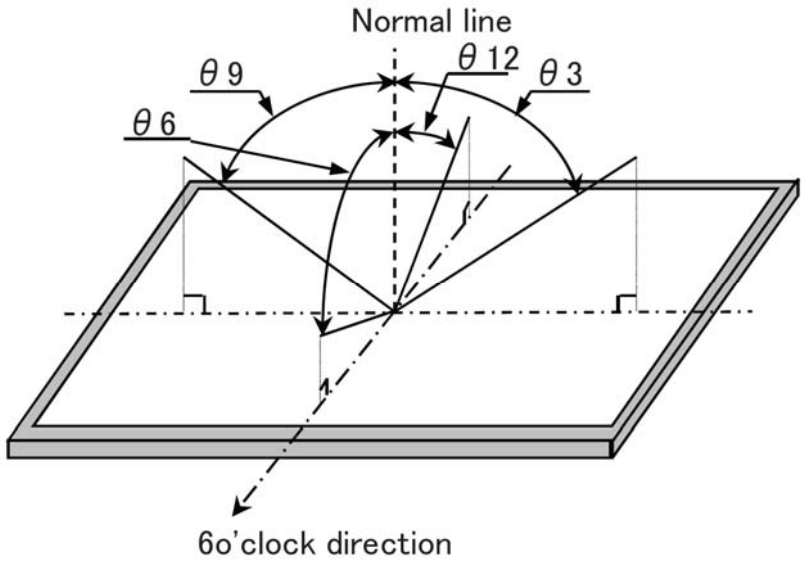


7. Optical Specifications

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing angle	Horizontal	θ3	CR>10	70	85	-	Deg.	Note1,2,4
		θ9		70	85	-	Deg.	
	Vertical	θ6		70	85	-	Deg.	
		θ12		70	85	-	Deg.	
Contrast Ratio		CR	Optimized angle	900	1500	-		Note2,4
Response Time(White Black)		Tr+Td	θ=0°	-	35	-	ms	Note3,4
Chromaticity of White		Wx		0.255	0.305	0.355		Note4
		Wy		0.27	0.32	0.37		
Chromaticity of Red		Rx		Typ. -0.05	0.643	Typ. +0.05		
		Ry			0.344			
Chromaticity of Green		Gx			0.306			
		Gy			0.614			
Chromaticity of Blue		Bx			0.143			
		By			0.084			
NTSC ratio				-	70	-	%	Note4
Luminance of white		Y_{L1}		272	340	-	cd/m^2	Note4
White Uniformity		ΔL		75	-	-	%	Note5

These items are measured by BM-7 in the dark room (no ambient light)

Note1. Definitions of viewing angle range

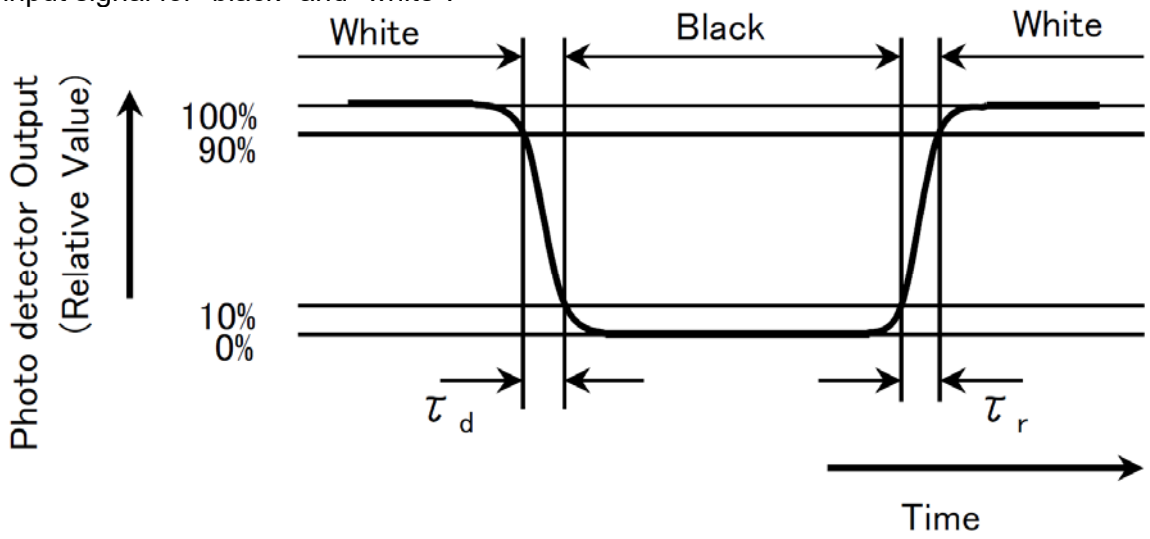


Note2. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

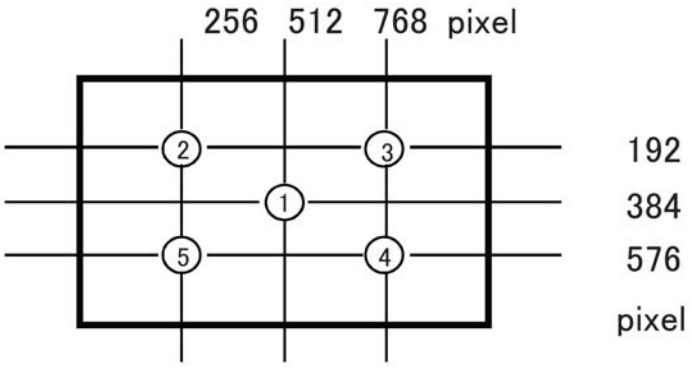
$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note3.
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



Note4.
This shall be measured at center of the screen.

Note5. Definition of white uniformity
White uniformity is defined as the following with five measurements.(①～⑤)



ΔL = [L(min.) of 5 points / L(max.) of 5 points] X 100%

8 Touch Panel Unit

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	ILI2510
Conductive susceptibility IEC/EN61000-4-6	10Vrms
Radiated Susceptibility IEC/EN61000-4-3	30V/m
Cover Glass	2mm 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	V_{DD}	4.75	5.0	5.25	V	
Power Consumption	I_{DD}		T.B.D		mA	

Interface

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

9. ELIABILITY TEST CONDITIONS

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	70±3°C , t=240 hrs	1,2
Low Temperature Storage	-25±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	40°C, 95% RH , 240 hrs	1,2
Thermal Shock Test	-25°C (30min) ~ 70°C (30min) 50 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.

10. GENERAL PRECAUTION

10-1 Safety

Liquid crystal is poisonous. Do not put it your month. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

10-2 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.

10-3 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.

10-4 Storage

1. Store the module in a dark room where must keep at +25±10℃ 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.

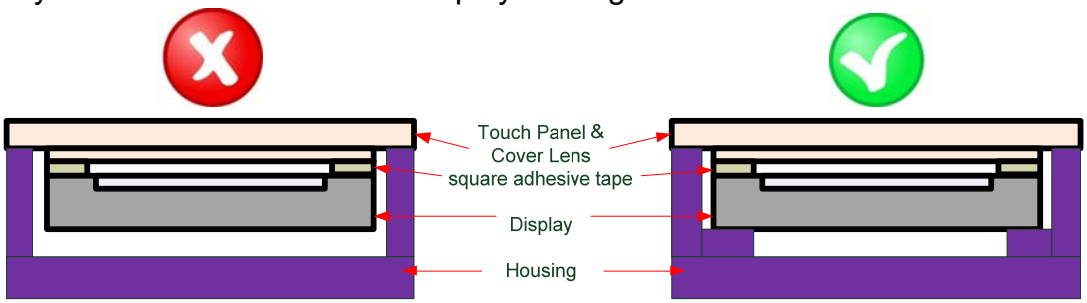
10-5 Cleaning

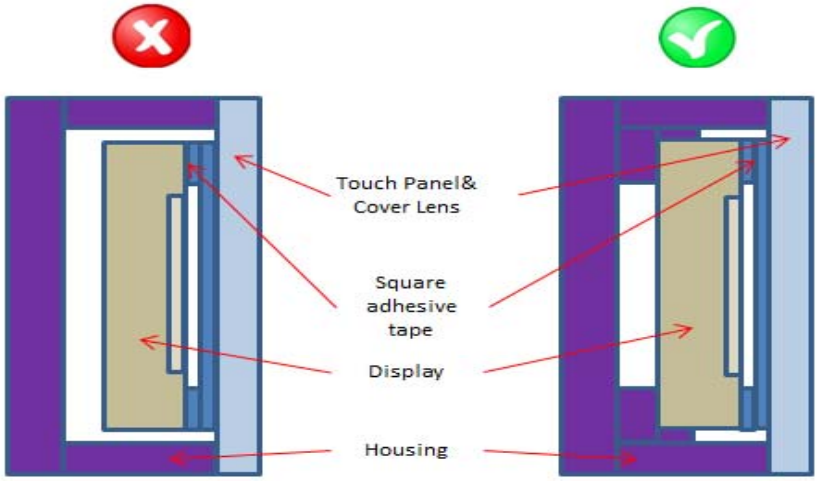
1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

10-6 Mechanism (if the LCM using air bonding)

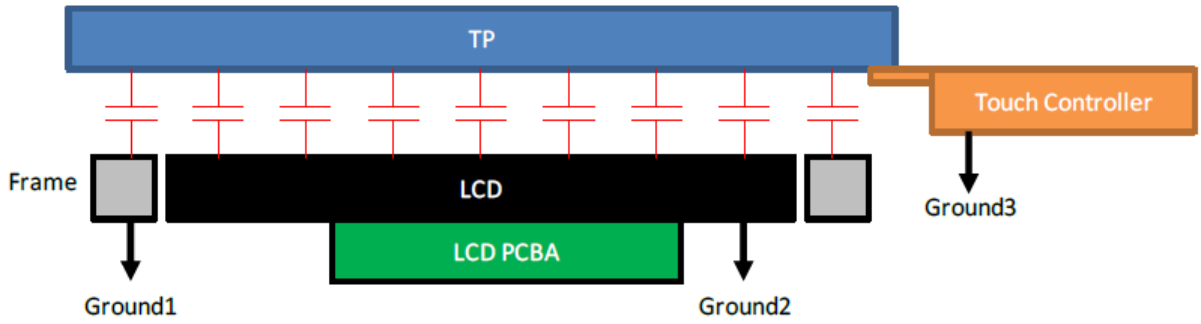
(1) Please mount LCD module by using mounting holes arranged in four corners tightly.

(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.

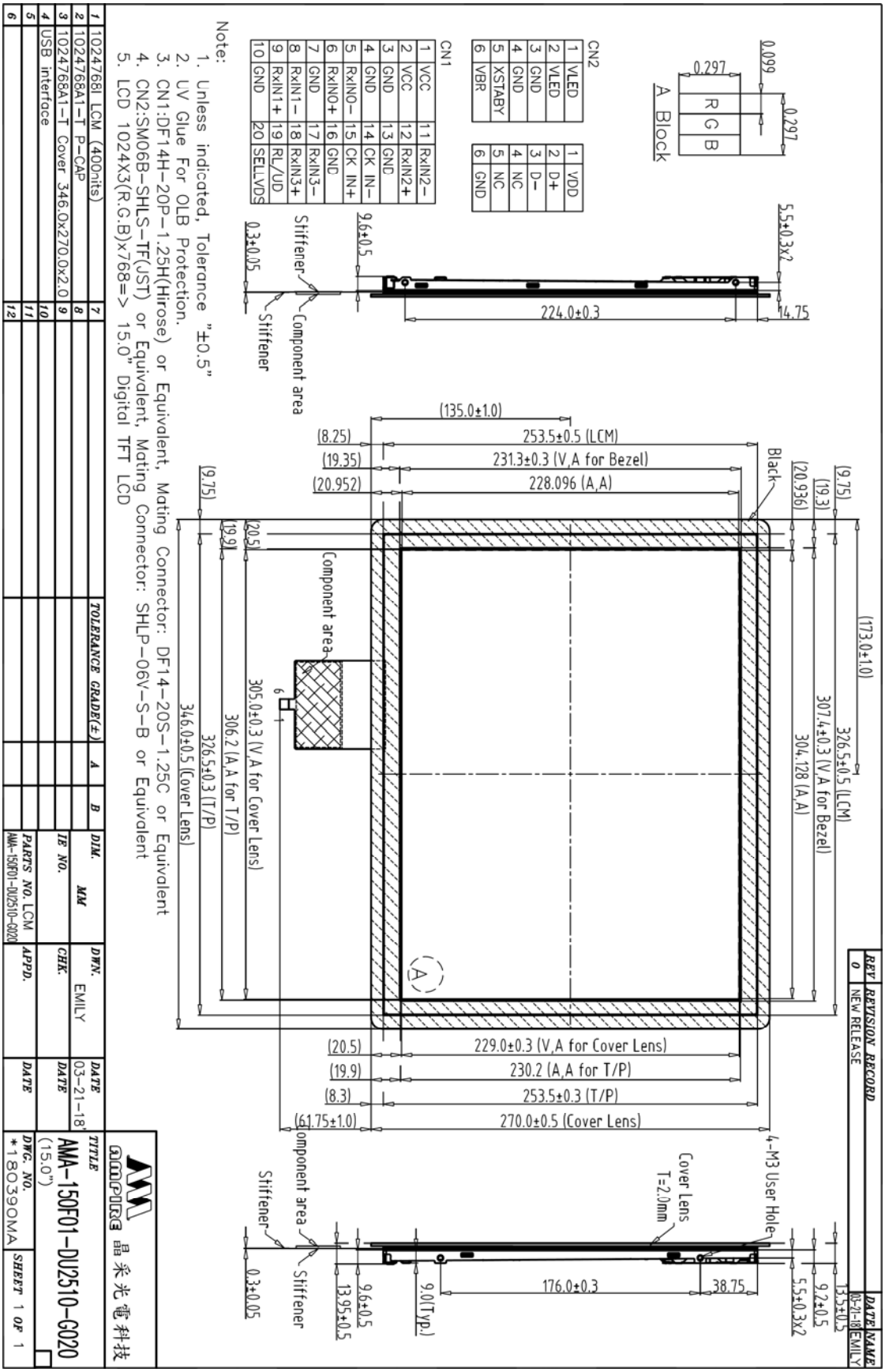


GND1, GND2 and GND3 should be connected together to have the same ground

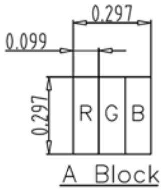
10-7 Others

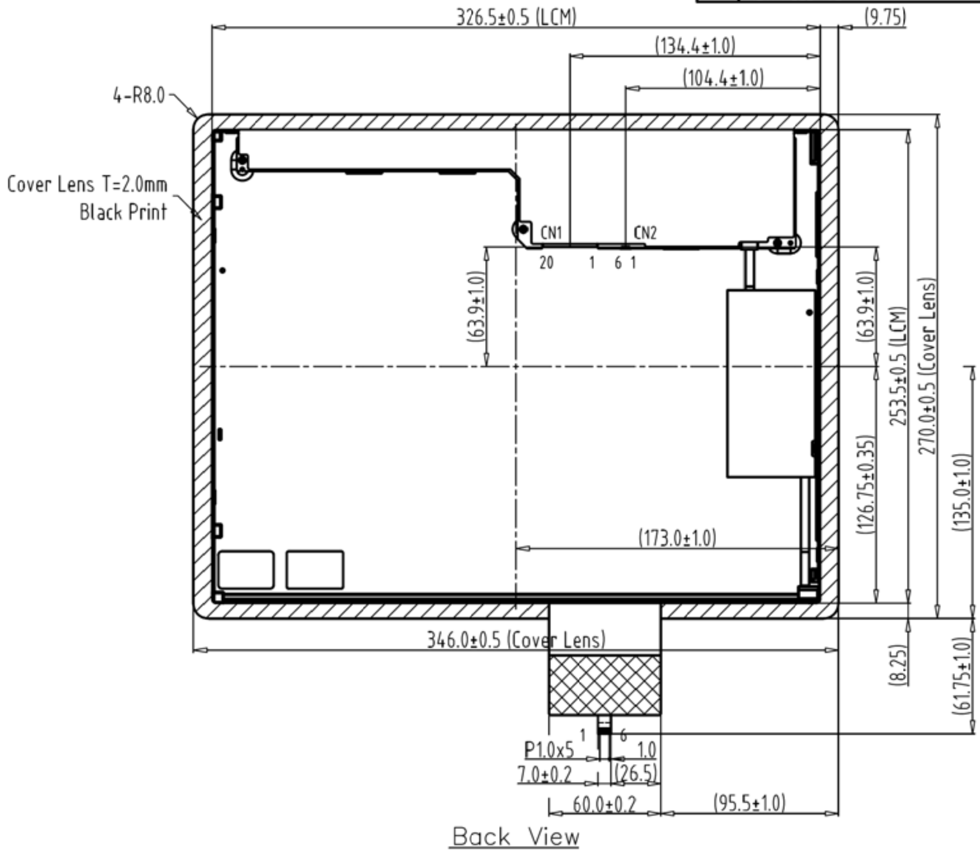
1. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
2. Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver

11. OUTLINE DIMENSION



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	03-21-18	EMILY





CN2

1	VLED		1	VDD
2	VLED		2	D+
3	GND		3	D−
4	GND		4	NC
5	XSTABY		5	NC
6	VBR		6	GND

CN1

1	VCC	11	RxIN2−
2	VCC	12	RxIN2+
3	GND	13	GND
4	GND	14	CK IN−
5	RxIN0−	15	CK IN+
6	RxIN0+	16	GND
7	GND	17	RxIN3−
8	RxIN1−	18	RxIN3+
9	RxIN1+	19	RL/UD
10	GND	20	SELLVDS

Note:

1. Unless indicated, Tolerance "±0.5"
2. UV Glue For OLB Protection.
3. CN1:DF14H−20P−1.25H(Hirose) or Equivalent, Mating Connector: DF14−20S−1.25C or Equivalent
4. CN2:SM06B−SHLS−TF(JST) or Equivalent, Mating Connector: SHLP−06V−S−B or Equivalent
5. LCD 1024X3(R.G.B)x768=> 15.0" Digital TFT LCD

1	1024768I LCM (400nits)	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. EMILY	DATE 03−21−18'
2	1024768A1−T P−CAP	8					IE NO.	CHK.	DATE
3	1024768A1−T Cover 346.0x270.0x2.0	9							
4	USB interface	10					PARTS NO. LCM−1 AMA−150F01−DU2510−G020	APPD.	DATE
5		11							
6		12							

AMPIRE 晶采光電科技

TITLE: AMA−150F01−DU2510−G020 (15.0")

DWG. NO. *180391MA | SHEET 1 OF 1