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-800600MVVNQW-T00H**
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
2022/03/21	--	New Release	Jessica

1. Instruction

Ampire 8.4” Display Module is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD panel, a driving circuit. This TFT-LCD has a high resolution (800(R.G.B) X 600) and can display up to 262,144 colors.

1.1 Features

(1) Construction: a-Si TFT-LCD with driving system, White LED Backlight.

(2) LCD type : Transmissive , Normally White

(3) Number of the Colors :

(a) 262K colors (LVDS 6 bits mode) (default)

(b) 16.2M colors (LVDS 8 bits mode).

(4) LVDS Interface (Default setting: 6 bit mode).

(5) LCD Power Supply Voltage: 3.3V single power input, built-in power supply circuit.

(6) Build-in LED Driver IC (VCC=12V).

(7) Touch panel

- ✧ IC: EXC80W32
- ✧ Interface: USB

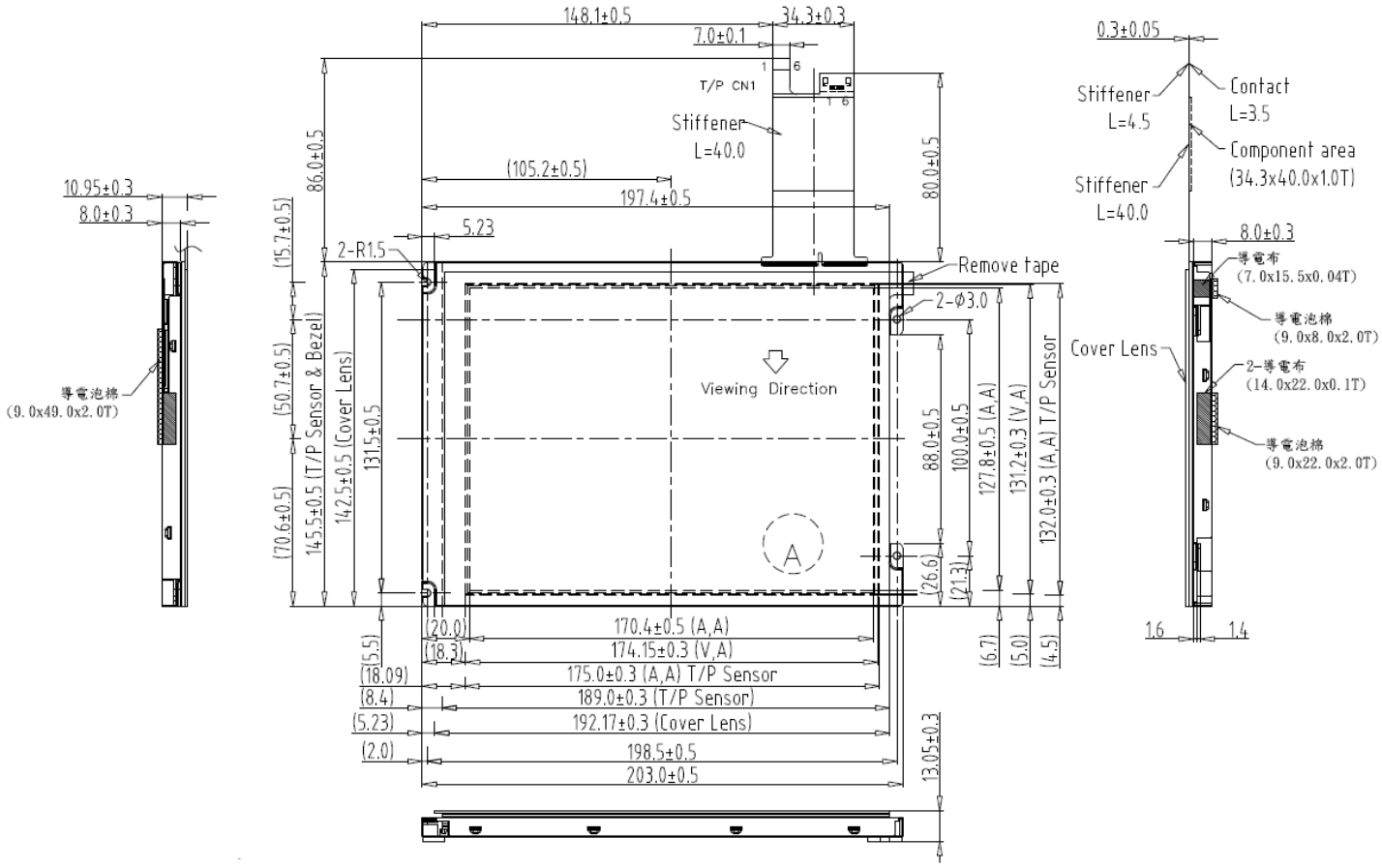
(8) Cover glass

- ✧ Thickness: 1.1mm

2. Physical Specifications

Item	Specifications	unit
Display resolution(dot)	800RGB (W) x 600(H)	dots
Pixel pitch	213 (W) x 213 (H)	um
Color configuration	R.G.B -stripe	
Weight	T.B.D.	g
Backlight unit	LED	
Display color	262K (default)	colors

If user wants to change the default setting for mass production, please contact with Ampire. We'll apply a new P/N for you.



3. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
Supply voltage range	VDD	-0.3	4	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(1) All voltage values are with respect to the GND terminals unless otherwise noted.

4. Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Response Time		$T_r + T_f$	Θ=Φ=0°	-	16	25	ms	(1),(2),(5)
Contrast ratio		CR		480	600	-	-	(1),(2),(4)
Viewing Angle	Horizontal	ΘL	CR≧10	70	80	-	Deg.	(1),(2),(3)
		ΘR		70	80	-		
	Vertical	ΘU		50	60	-		
		ΘD		70	80	-		
Luminance (Center)		L	Θ=Φ=0° IF=150mA Ta=25℃	**340**	**425**	-	cd/m^2	(1),(2),(6)
Luminance Uniformity		ΔL		-	70	-	%	(1),(2),(6)
Color chromaticity	White	Wx		Typ. -0.05	0.310	Typ. +0.05	-	(1),(2),(6)
		Wy			0.330		-	
	Red	Rx			0.603		-	
		Ry			0.336		-	
	Green	Gx			0.326		-	
		Gy			0.546		-	
	Blue	Bx			0.159		-	
		By			0.110		-	

Measuring Condition

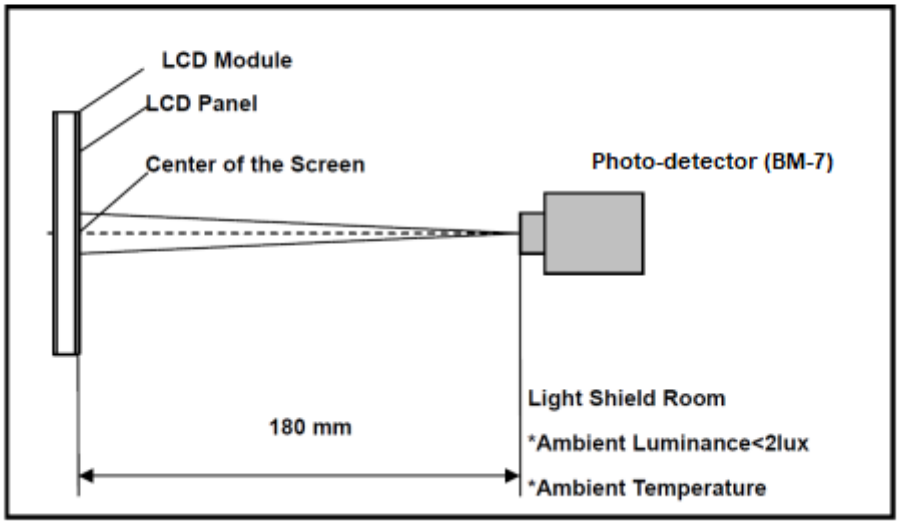
Measuring surrounding: dark room, LED current IF

Ambient temperature: 25±2oC

15min. Warm-up time

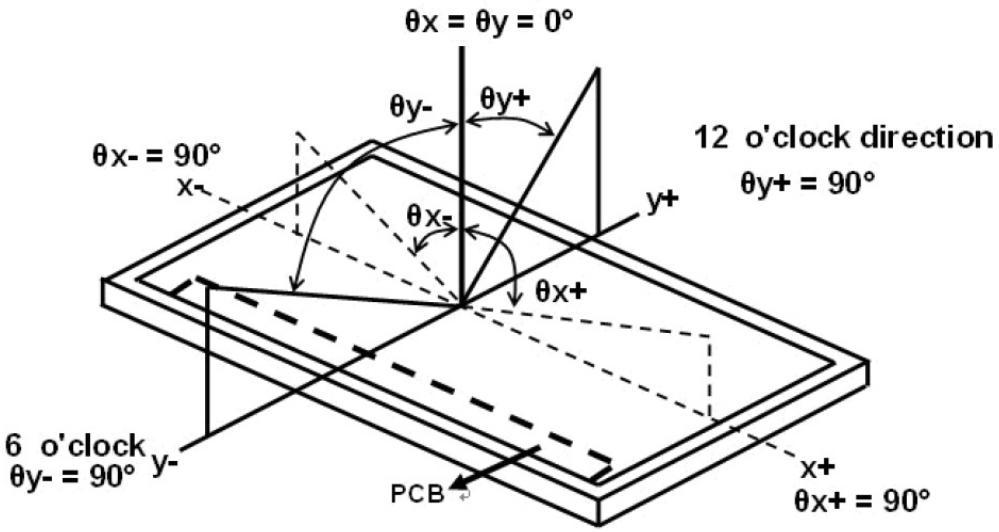
Note(1) Measurement Setup:

The LCD module should be stabilized at given temperature(25℃) for 15 minutes to Avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note(2) The LED input parameter setting as: PWM: duty 100 %

Note(3) Definition of viewing angle:



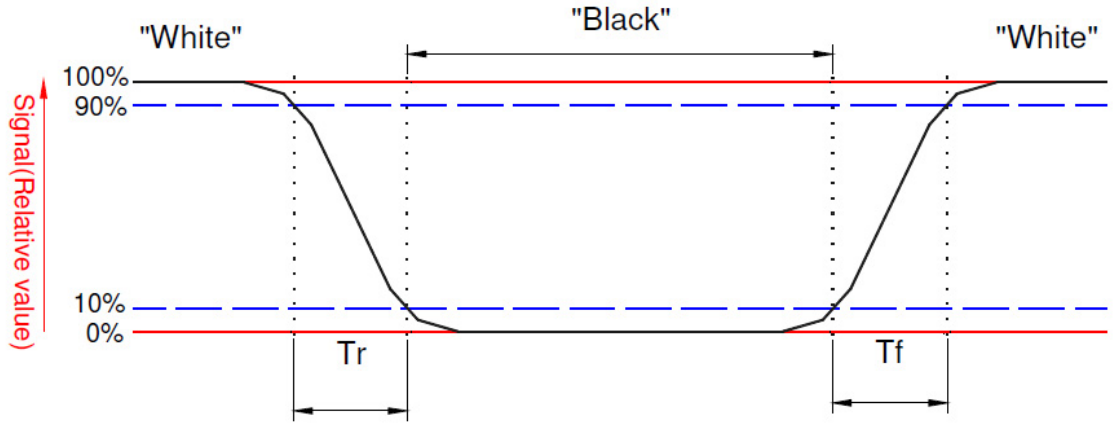
Note(4) Definition of Contrast Ratio (CR)

Measured at the center point of panel

$$\text{Contrast Ratio(CR)} = \frac{\textit{Luminance measured when LCD on the "White" state}}{\textit{Luminance measured when LCD on the "Black" state}}$$

Note(5) Definition of Response Time (Tr, Tf)

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

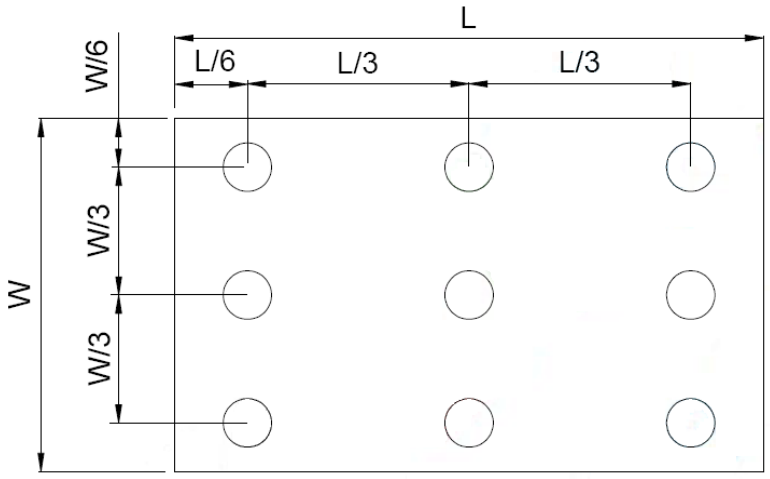


Note(6) Definition of Brightness Uniformity

Active area is divided into 9 measuring areas (Refer to bellow figure). Every measuring point is placed at the center of each measuring area.

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

L ----- Active area length W ----- Active area width



Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.

5. Electrical Characteristics

5.1 Power Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Logic / LCD Driving Voltage	VDD	3.0	3.3	3.6	V	
LCD Driving Current	IDD		T.B.D.		mA	(1)

Note(1) fV =60Hz , Ta=25℃ , Display pattern : All Black

5.2 LVDS electrical Specification

Vcc = 3.0 - 3.6V, Ta = -10 - +70 ˚C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
CMOS/TTL DC SPECIFICATIONS						
V_{IH}	High Level Input Voltage		2.0		Vcc	V
V_{IL}	Low Level Input Voltage		GND		0.8	V
V_{OH}	High Level output Voltage	I_{OH}=-4mA	2.4			V
V_{OL}	Low Level Output Voltage	I_{OL}=4mA			0.4	V
I_{IN}	Input Current	0V ≦ V_{IN} ≦ Vcc			±10	μA
I_{PD}	Pull Down Current	R/F pin,V_{IH}=Vcc			100	μA
I_{OS}	Output Short Circuit Current	V_{OUT}=0V			-50	mA
LVDS DRIVER DC SPECIFICATIONS						
V_{OD}	Differential Output Voltage	RL=100Ω	250	350	450	mV
ΔV_{OD}	Change in VOD between Complimentary Output States				35	mV
V_{OC}	Common Mode Voltage		1.125	1.25	1.375	V
ΔV_{OC}	Change in VOC between Complimentary Output States				35	mV
I_{OS}	Output Short Circuit Current	V_{OUT}=0V,RL=100Ω			-24	mA
I_{OZ}	Output TRI-STATE Current	/PDWN=0V, V_{OUT}=0V to Vcc			±10	μA
LVDS RECEIVER DC SPECIFICATIONS						
V_{TH}	Differential Input High Threshold	V_{OC}=+1.2V			+100	mV
V_{TL}	Differential Input low Threshold		-100			mV
I_{IN}	Input Current	V_{IN}=+2.4V/ 0V Vcc=3.6V			±10	μA

6. Backlight Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	VCC	10.8	12.0	12.6	V	
Input Current	ICC	--	T.B.D	--	mA	100% PWM duty
Dimming Frequency	Fpwm	200		30K	Hz	
Dimming Voltage High		2	--	5.0	V	
Dimming Voltage Low		0	--	0.8	V	
LED Forward Current	IF	--	150		mA	Ta=25℃
LED Forward Voltage	VF	16.2	18.0	19.8	V	IF=150mA, Ta=25℃
LED life time			50,000	-	Hr	IF=150mA, Ta=25℃

Note(1) Ta means ambient temperature of TFT-LCD module.

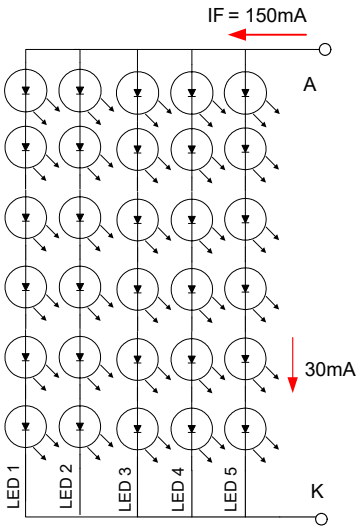
Note(2) VCC, ICC are defined for LED B/L. (100% duty of PWM dimming)

Note(3) IF, VF, Fpwm are defined for LED Driver.

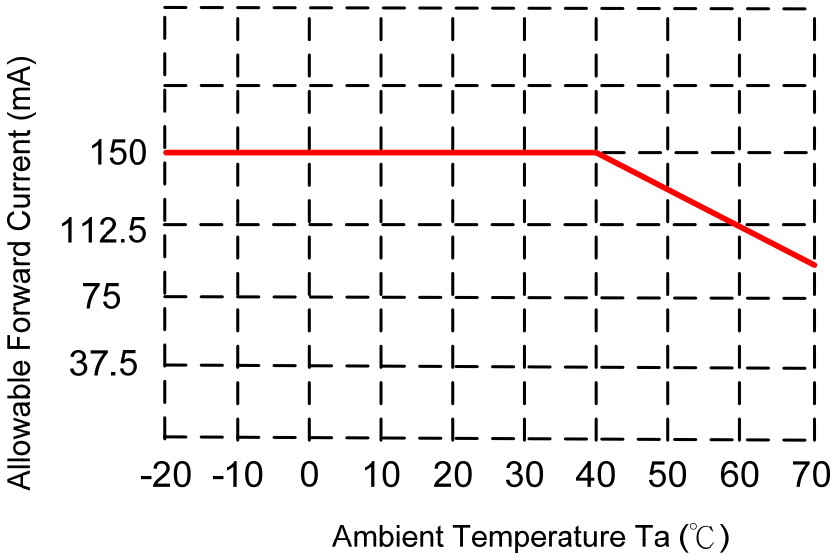
Note(4) If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note(5) Operating life means brightness goes down to 50% minimum brightness. LED life time is estimated data.

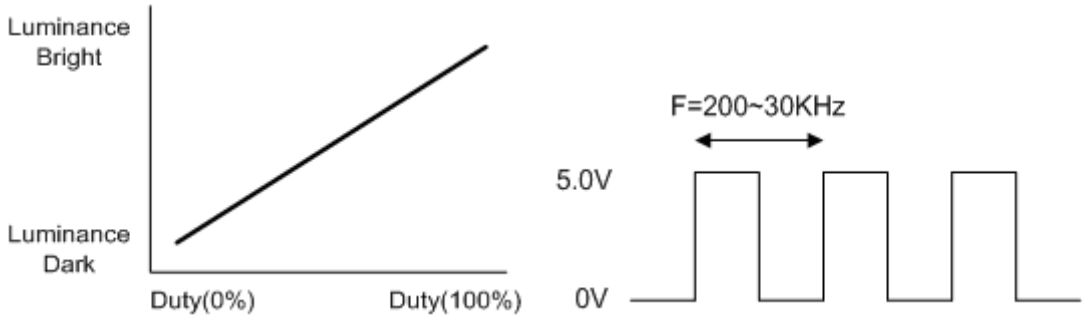
Note(6) The structure of LED B/L shows as below.



Note(7) When LCM is operated over 40℃ ambient temperature, the **IF** should be follow :



6.1 PWM Dimming Control



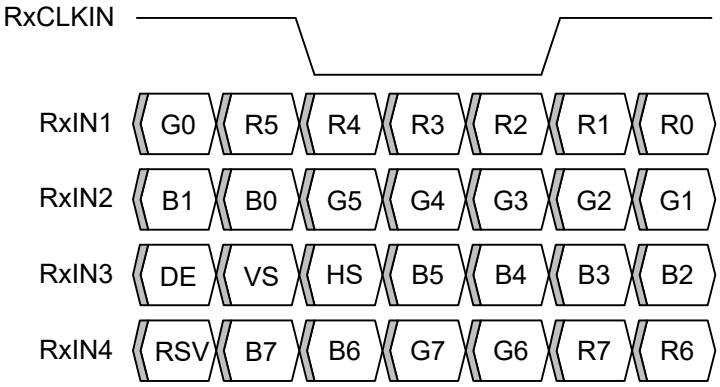
7. Interface

7.1 Interface Definition

CN1: LVDS Connector

Pin no	Symbol	Function
1	VDD	Power Supply:3.3V
2	VDD	Power Supply:3.3V
3	UD	Vertical Reverse Scan Control.
4	LR	Horizontal Reverse Scan Control.
5	RXIN1-	Transmission Data of Pixels 1
6	RXIN1+	Transmission Data of Pixels 1
7	GND	Power Ground
8	RXIN2-	Transmission Data of Pixels 2
9	RXIN2+	Transmission Data of Pixels 2
10	GND	Power Ground
11	RXIN3-	Transmission Data of Pixels 3
12	RXIN3+	Transmission Data of Pixels 3
13	GND	Power Ground
14	RXCKIN-	Sampling Clock
15	RXCKIN+	Sampling Clock
16	GND	Power Ground
17	NC	No connection
18	NC	No connection
19	NC	**LVDS 6 bits mode : No connection (default)** LVDS 8 bit mode : (RXIN4-) Transmission Data of Pixels 4
20	NC	**LVDS 6 bits mode : No connection (default)** LVDS 8 bit mode : (RXIN4+) Transmission Data of Pixels 4

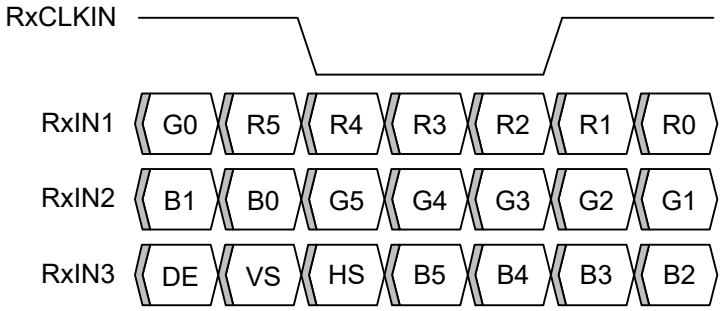
8 bits LVDS input



Note: R/G/B data 7 : MSB, R/G/B data 0 : LSB

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 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 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Date 7 (MSB) Green Date 6 Green Date 5 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 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 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 8 bits pixel data.
RxCLKIN+ RxCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

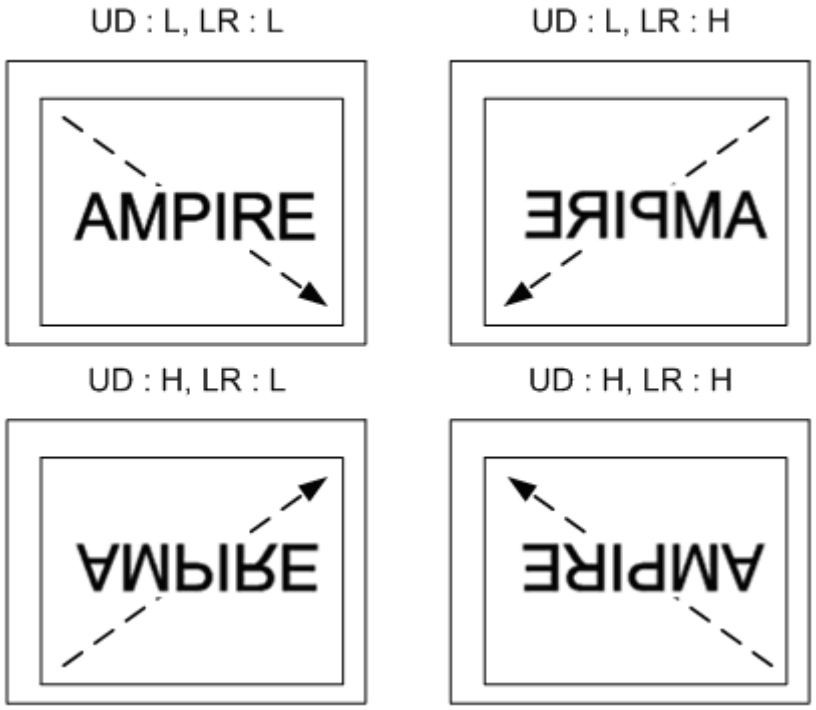
6 bits LVDS input



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	

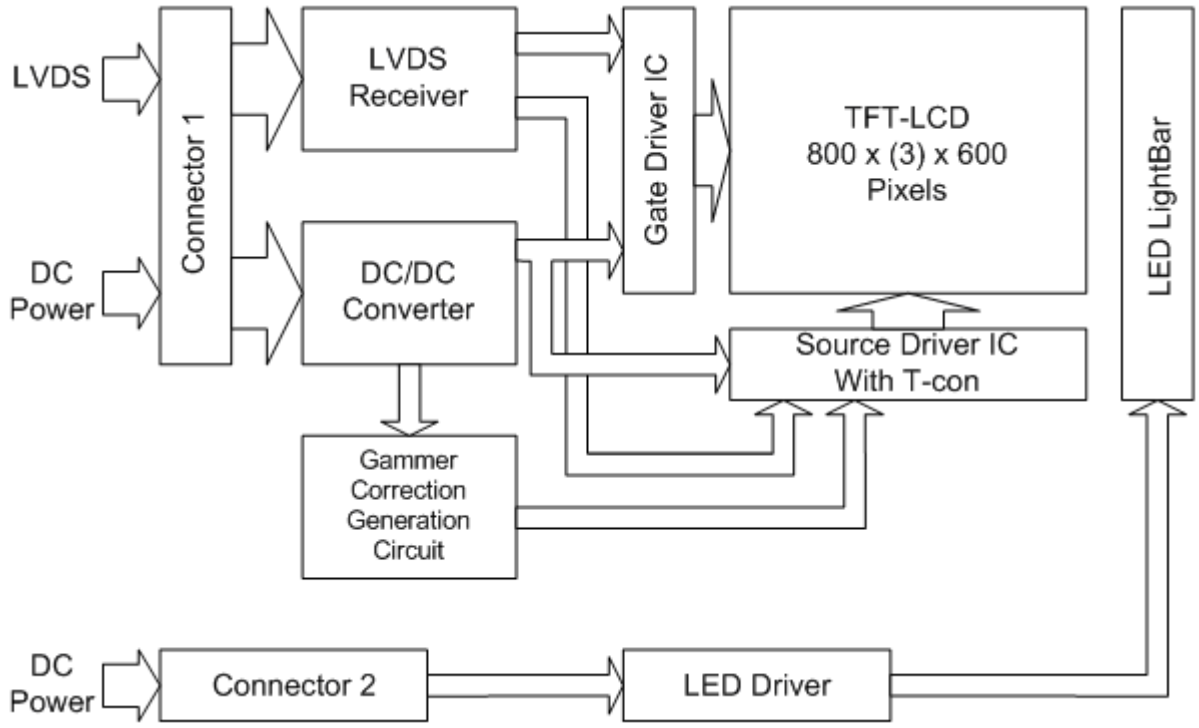
Setting of scan control input		Scanning direction
UD	LR	
GND	GND	Up to Down, Left to Right
VDD	VDD	Down to Up, Right to Left
GND	VDD	Up to Down, Right to Left
VDD	GND	Down to Up, Left to Right



CN2: LED Driver Connector

Pin no	Symbol	Function
1	VCC	12V input
2	GND	GND
3	ENABLE	+3.3V:ON, 0V:OFF
4	DIMMING	PWM

7.2 Block Diagram



8. AC Timing characteristic

8.1 AC Timing characteristic of LVDS

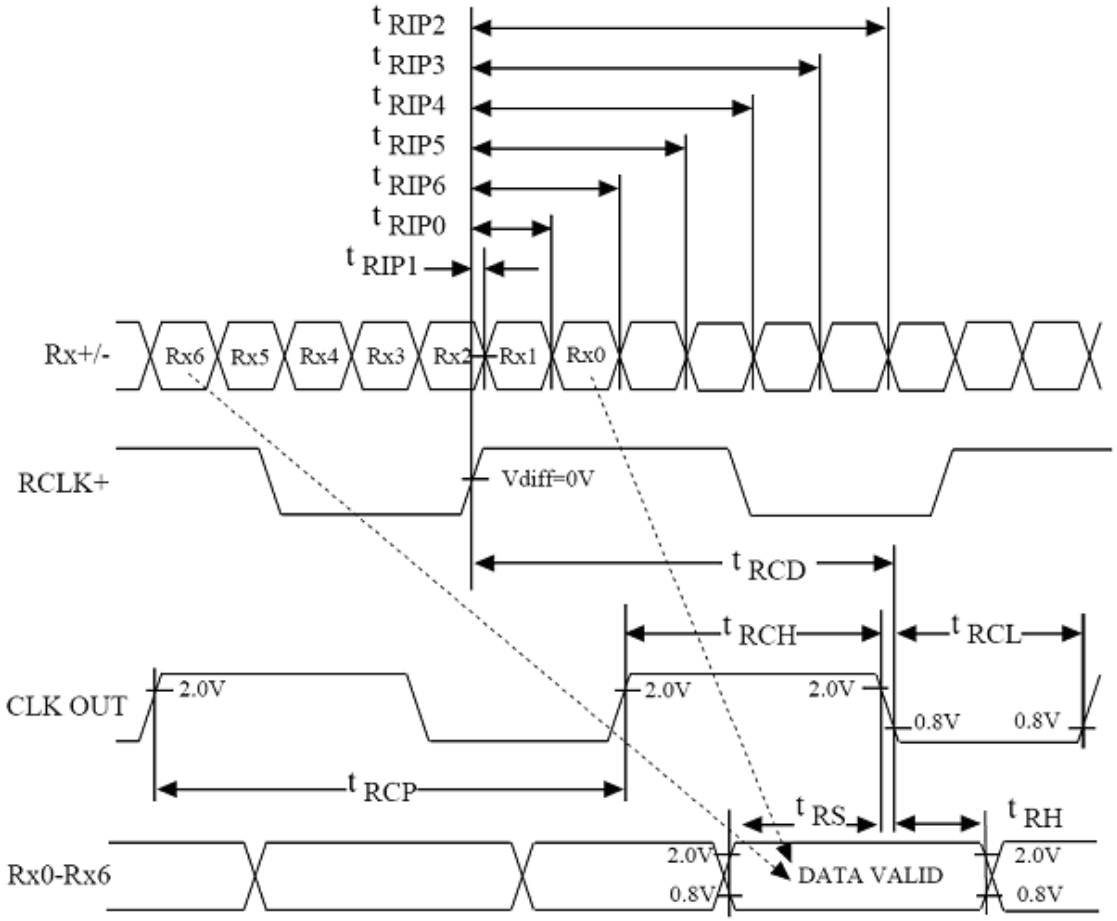
Switching Characteristics

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

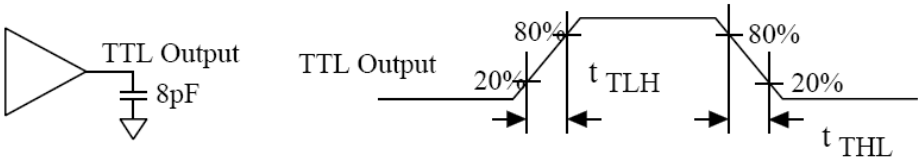
RECEIVER DEVICE



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

RECEIVER DEVICE TRANSITION TIMES

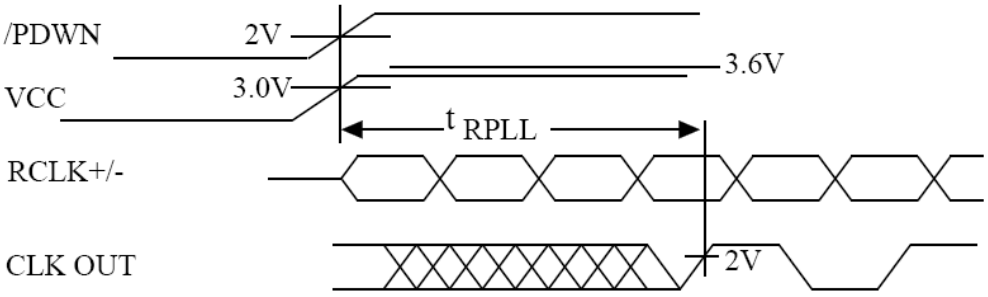
TTL Output



TTL output load

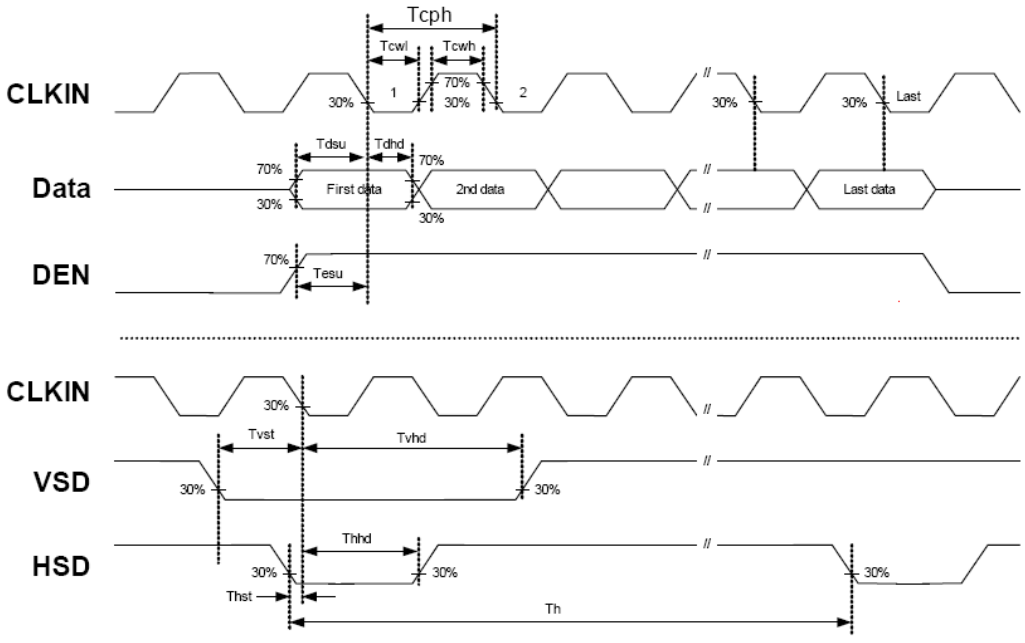
PHASE LOCK LOOP SET TIME

RECEIVER DEVICE

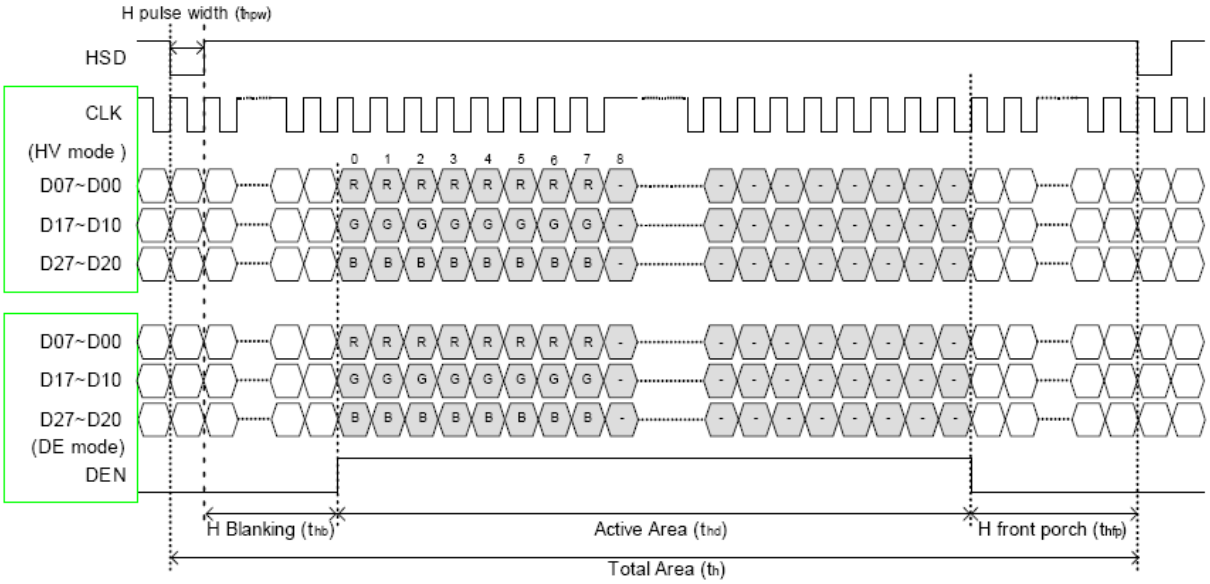


8.2 AC Timing characteristic of Panel

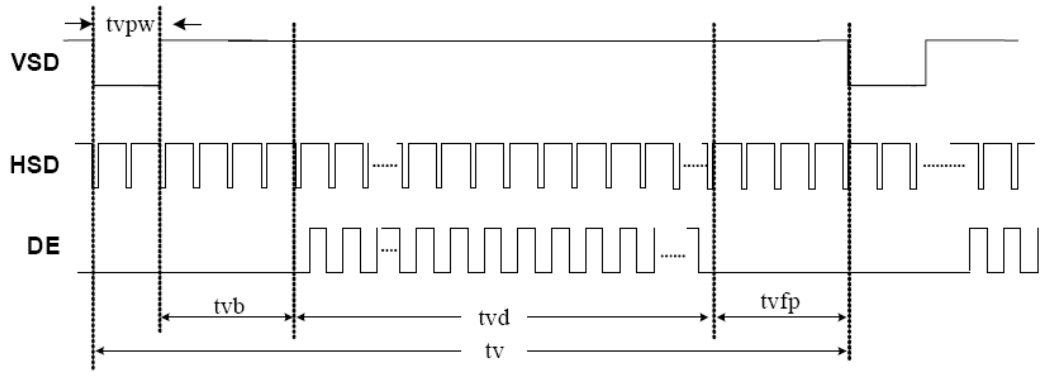
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tcph	20			ns	
DCLK frequency	fclk		40	50	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSD setup time	Tvst	8			ns	
VSD hold time	Tvhd	8			ns	
HSD setup time	Thst	8			ns	
HSD hold time	Thhd	8			ns	
Data setup time	Tdsu	8			ns	
Data hold time	Tdhd	8			ns	
DE setup time	Tesu	8			ns	
DE hold time	Tehd	8			ns	
Horizontal display area	thd		800		Tcph	
HSD period time	th		1000		Tcph	
HSD pulse width	thpw	1	48		Tcph	
HSD back porch	thb		40		Tcph	
HSD front porch	thfp		112		Tcph	
Vertical display area	tvd		600		th	
VSD period time	tv		660		th	
VSD pulse width	tvpw		3		th	
VSD back porch	tvb		39		th	
VSD front porch	tvfp		18		th	



Sampling clock timing

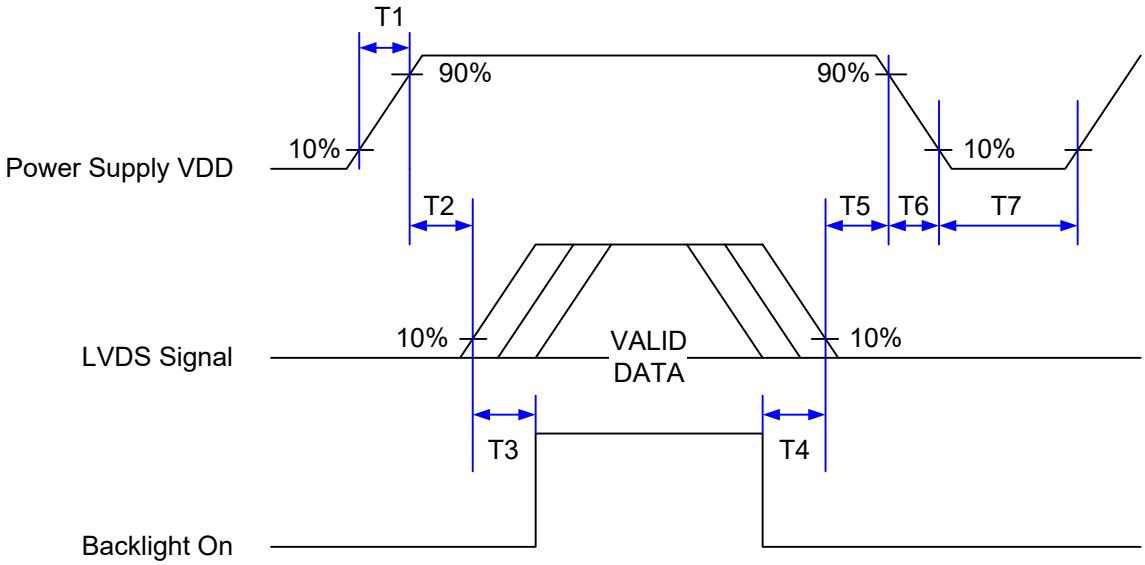


Horizontal display timing range



Vertical timing

9. Power ON/OFF Sequence



Symbol	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	--	20	ms
T2	0	40	50	ms
T3	200	--	--	ms
T4	200	--	--	ms
T5	0	40	50	ms
T6	0	--	20	ms
T7	1000	--	--	ms

10. Touch Panel Electrical Specification

Touch Screen	Projected Capacitive Type
Host interface	**USB**
IC controller	EXC80W32

Item	Symbol	Min.	Typ.	Max.	Unit
Touch Panel Power Supply	VIN	4.75	5	5.25	V
Touch Panel Supply Current	IVIN	--	TBD	--	mA

Pin No	Symbol	Function
1	DGND	Digital ground Power
2	DA-	USB differential signal
3	DA+	USB differential signal
4	VIN	USB Power 5V
5	NA	No connection
6	NA	No connection

11. 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
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.

12. Use Precautions

12.1 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.

12.2 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.

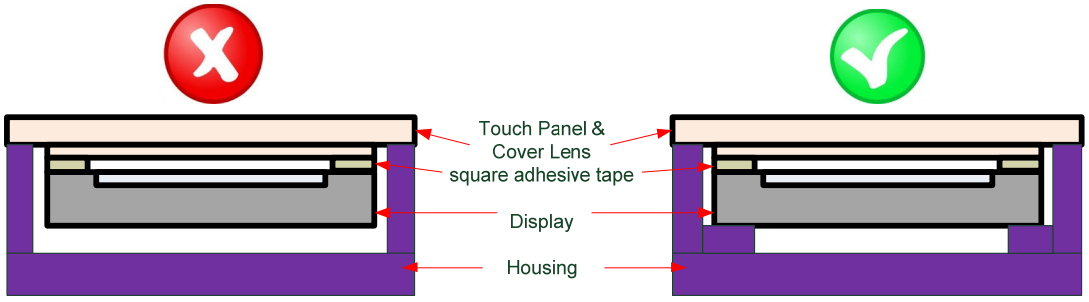
(2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.

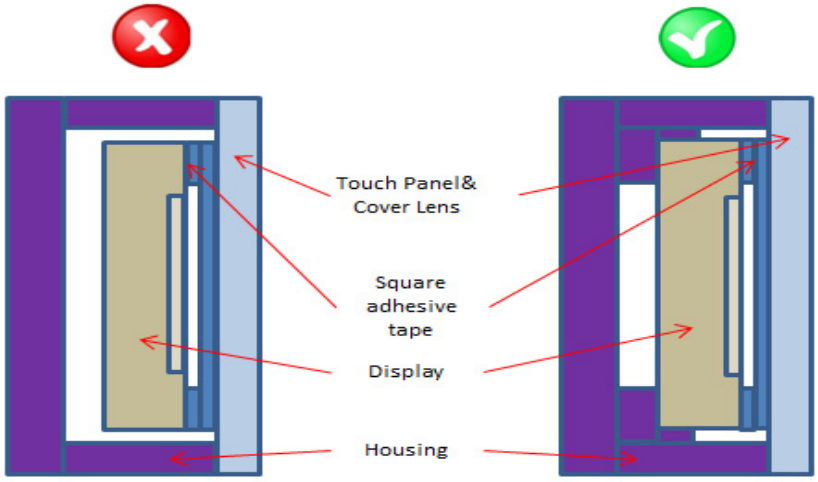
(3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.

(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.

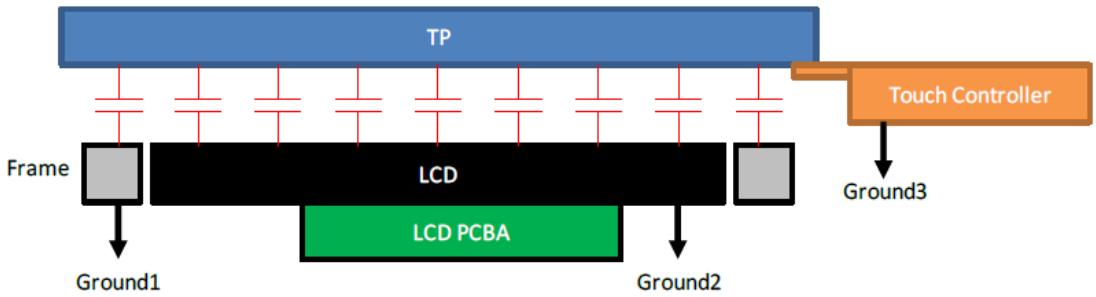
(5) Please hold the LCD module properly when you use or store it.

(6) 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.





(7) 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

12.3 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.

12.4 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.

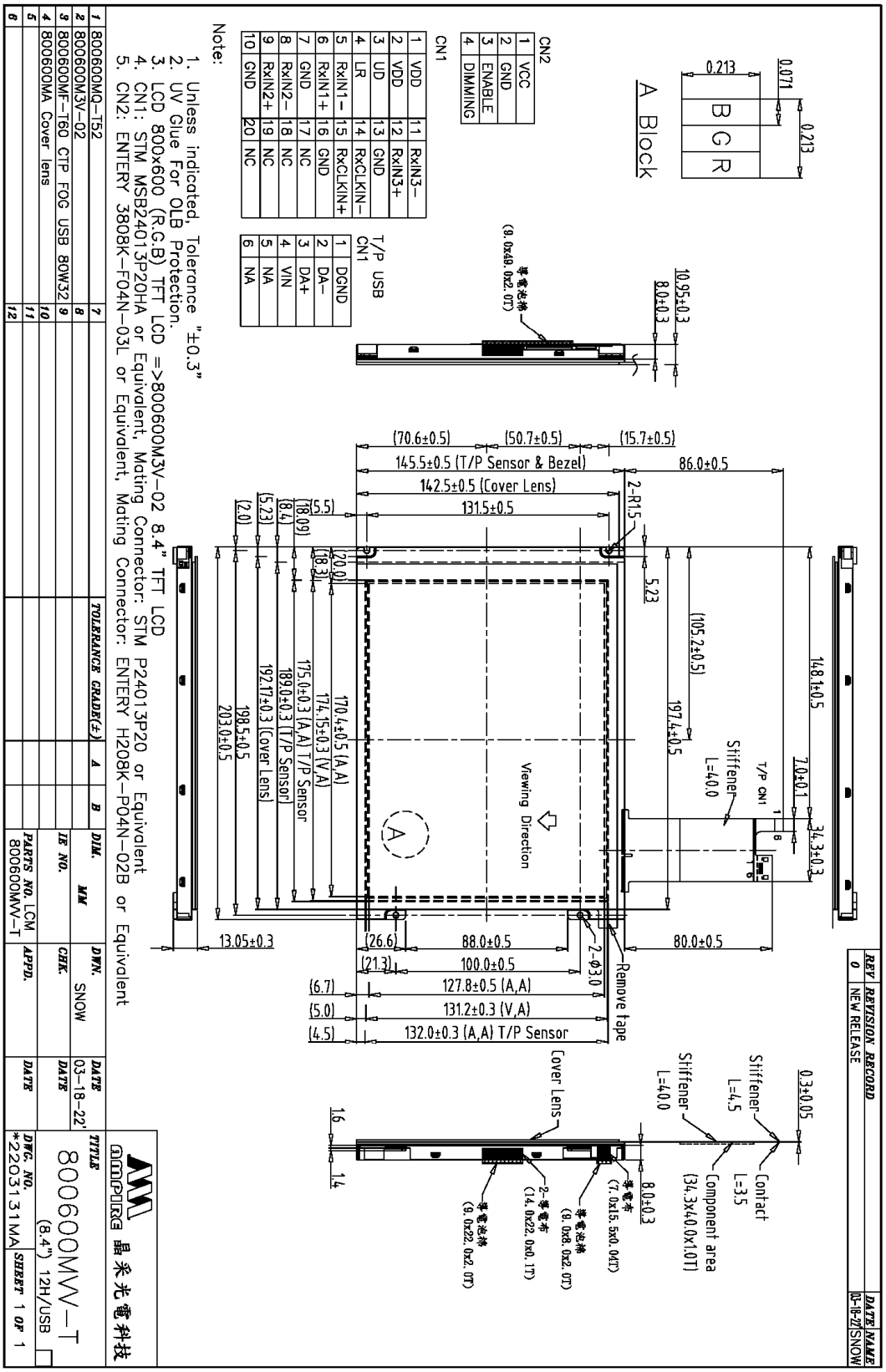
12.5 Other

(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.

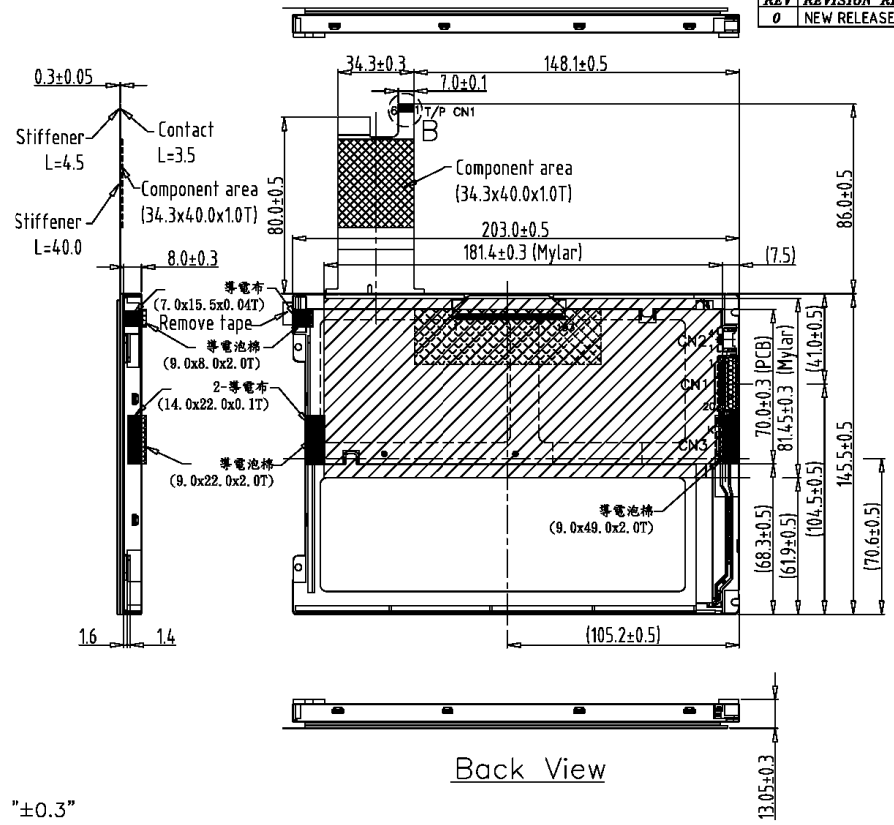
(2) Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.

(3) AMIPRE will provide one year warranty for all products and three months warrantee for all repairing products.

13. Outline Dimension



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	03-18-22'	SNOW



T/P USB CN1

1	DGND
2	DA−
3	DA+
4	VIN
5	NA
6	NA

CN2

1	VCC
2	GND
3	ENABLE
4	DIMMING

CN1

1	VDD	11	RxIN3−
2	VDD	12	RxIN3+
3	UD	13	GND
4	LR	14	RxCLKIN−
5	RxIN1−	15	RxCLKIN+
6	RxIN1+	16	GND
7	GND	17	NC
8	RxIN2−	18	NC
9	RxIN2+	19	NC
10	GND	20	NC

Note:

1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 800x600 (R.G.B) TFT LCD =>800600M3V−02 8.4" TFT LCD
4. CN1: STM MSB24013P20HA or Equivalent, Mating Connector: STM P24013P20 or Equivalent
5. CN2: ENTERY 3808K−F04N−03L or Equivalent, Mating Connector: ENTERY H208K−P04N−02B or Equivalent

1	800600MQ−T52	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. SNOW	DATE 03−18−22'
2	800600M3V−02	8					IE NO.	CHK.	DATE
3	800600MF−T60 CTP FOG USB 80W32	9					PARTS NO. LCM−1 800600MVV−T	APPD.	DATE
4	800600MA Cover lens	10							
5		11							
6		12							

AMPIRE 晶采光電科技

TITLE: 800600MVV−T (8.4") 12H/USB

DWG. NO. *2203132MA

SHEET 1 OF 1

12. Package

TBD