



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-800480L7TZQW-TN0H
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
2013/06/06	-	New Release	Alan

1. FEATURES

- (1) Construction : a-Si TFT-LCD with driving system, White LED Backlight, cover glass and projected capacitive touch panel.
- (2) LCD type : Transmissive , Normally White
- (3) Number of the Colors : 16.7M colors (R,G,B 8bit digital each)
- (4) LCD Power Supply Voltage : 3.3V single power input, built-in power supply circuit.
- (5) ROHS compliant.
- (6) EVA for wide viewing angle, no gray inversion

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display size (diagonal)	5.0	inch
Resolution	800 (W) x RGB x 480 (H)	dot
Display area	110.6 (W) x67.4 (H)	mm
Pixel pitch	0.135 (W) x 0.135 (H)	mm
Overall dimension	129.9(W) x 144.6(H) x8.175(D)	mm
Color configuration	R.G.B Vertical stripe	
Power Consumption of LED	3	watt

3. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power Supply for logic	VCC	-0.5	5.0	V	
Input Signal Voltage	VI	-0.5	VCC + 0.5	V	(1)
Operating Temperature of LCD	Top	-20	70	°C	(2)
Operating Temperature of Touch Panel	Top	-20	60	°C	
Storage Temperature	Tstg	-30	80	°C	

Note 1: Hsync, Vsync, DEN, DCLK, R0~R7, G0~G7, B0~B7

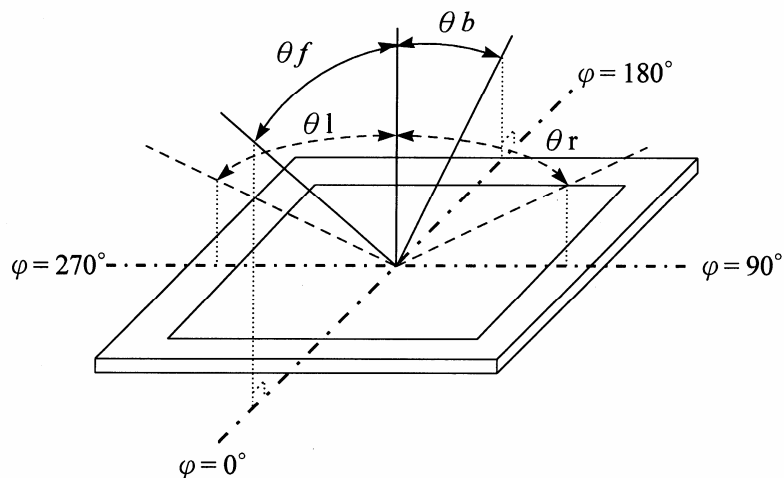
Note 2: Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

4. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Viewing Angle	Front	θf	$CR \geq 10$	75	85	--	deg.	(1)(2)(3)
	Back	θb		75	85	--		
	Left	θl		75	85	--		
	Right	θr		75	85	--		
Contrast ratio	CR	$\Theta = \Phi = 0^\circ$	150	250	--	--	(1)(3)	
Response Time	T_r	$\Theta = \Phi = 0^\circ$	--	15	30	ms	(1)(4)	
	T_f		--	35	50	ms	(1)(4)	
Color chromaticity	Red	Rx	$\Theta = \Phi = 0^\circ$	0.585	0.615	0.645	--	(1)
		Ry		0.314	0.344	0.374		
	Green	Gx		0.277	0.307	0.337		
		Gy		0.532	0.562	0.592		
	Blue	Bx		0.103	0.133	0.163		
		By		0.120	0.150	0.180		
	White	Wx		0.279	0.309	0.339		
		Wy		0.320	0.350	0.380		
Luminance (ILED=240mA)	L	$\Theta = \Phi = 0^\circ$	--	500	--	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



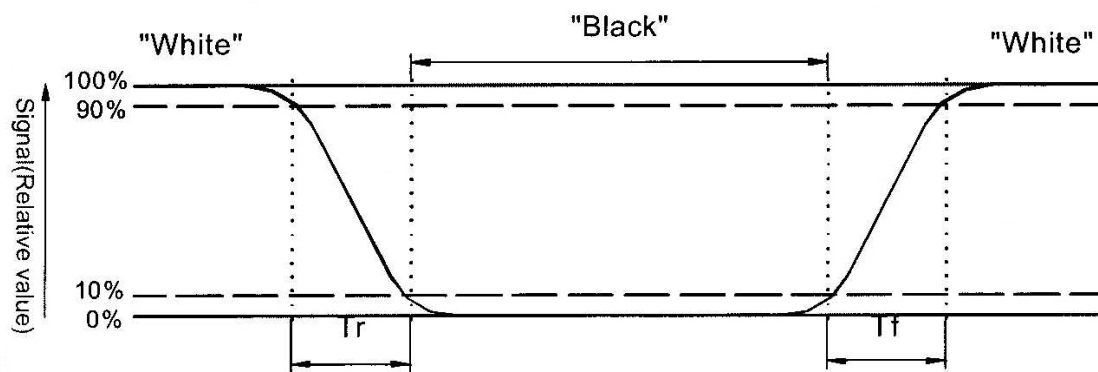
Note 3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

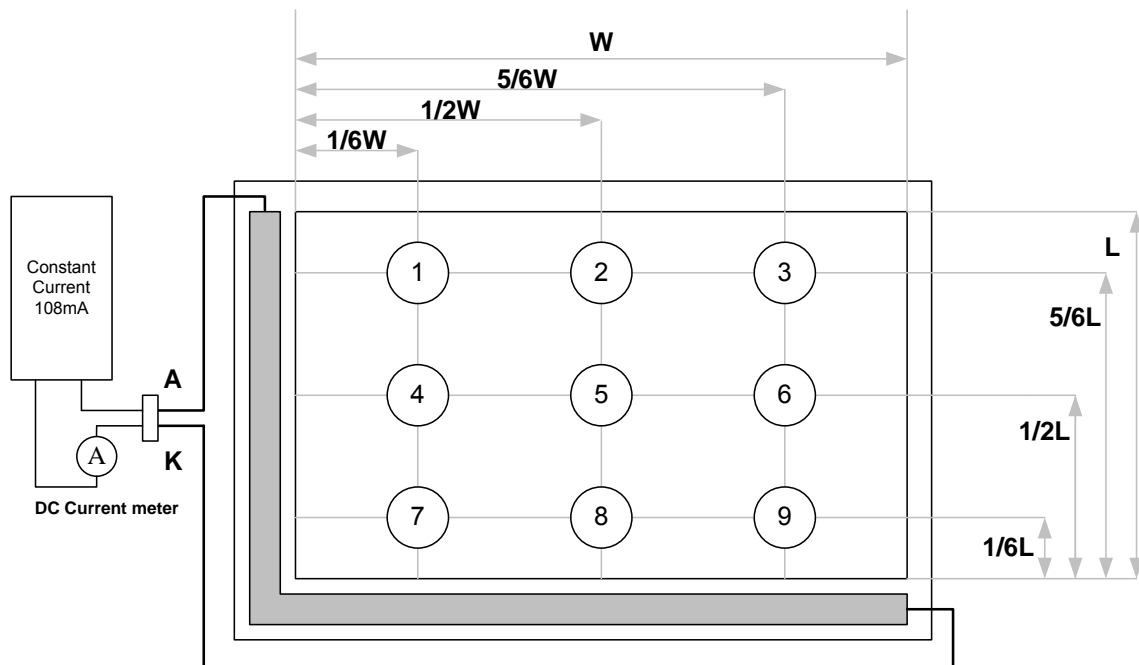
$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

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

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

5. ELECTRICAL CHARACTERISTICS

5.1 LCD driving

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply voltage	V _{CC}	3.0	3.3	3.6	V	
Input voltage for logic	H Level	0.7 V _{CC}	--	V _{CC}	V	(1)
	L Level	0	--	0.3 V _{CC}	V	
Power Supply current	I _{CC}	--	170	--	mA	(2)
LED Life time	-		30k		Hrs	(3)

Note 1: Hsync, Vsync, DEN, DCLK, R0~R7, G0~G7, B0~B7

Note 2: f_V =60Hz , Ta=25°C , Display pattern : All Black

*:Will be reference only

Note 3: Condition: Ta=25°C, continuous lighting

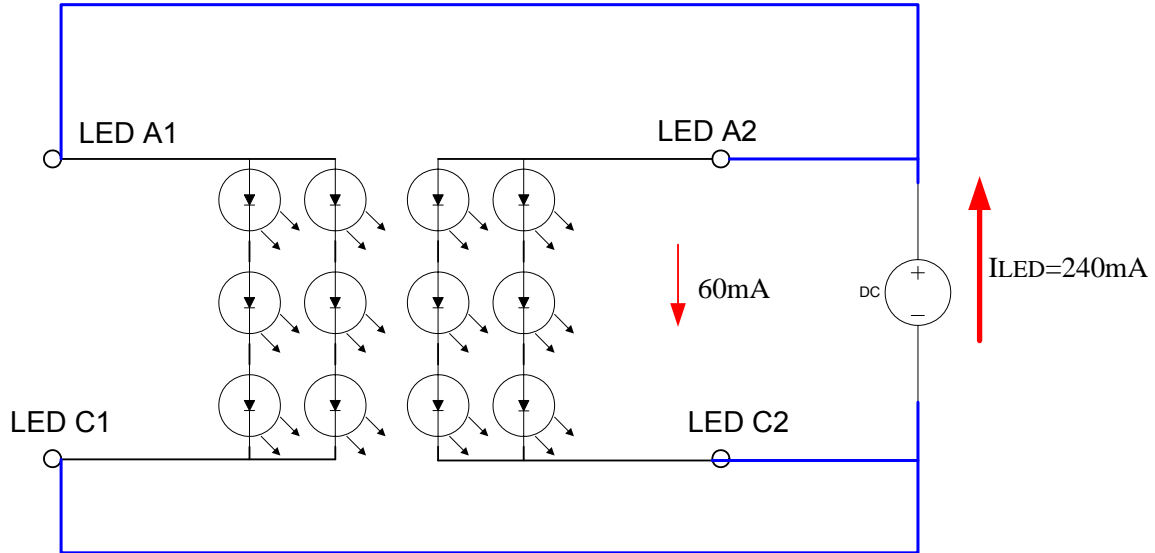
Life time is estimated data.

Definitions of failure:

1. LCM brightness becomes half of the minimum value.
2. LED doesn't light normally.

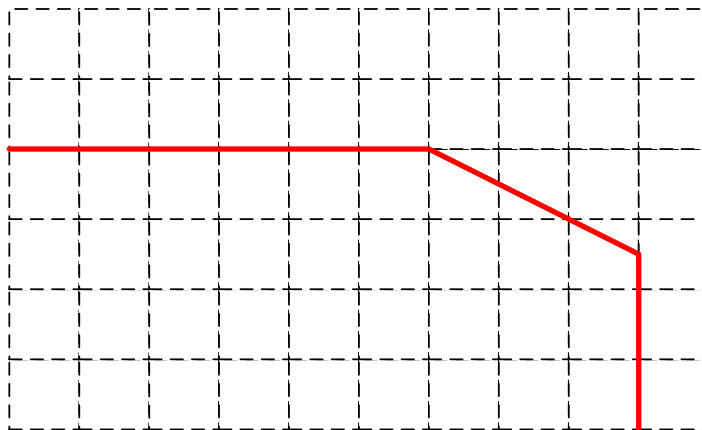
5.2 Electrical characteristic of LED Back-light

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
LED voltage	V_{AK}	--	9.9	10.8	V	$I_{LED} = 240mA, T_a = 25^\circ C$
LED forward current	I_{LED}	--	240	--		$T_a = 25^\circ C$

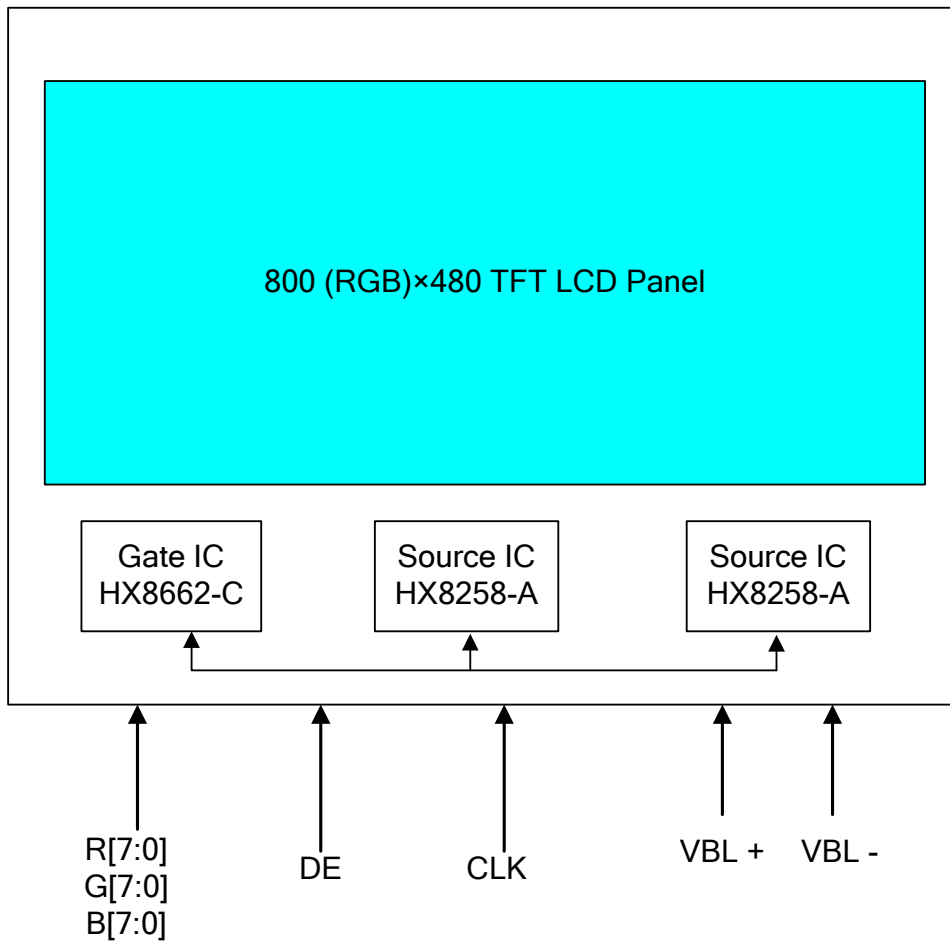


- The constant current source is needed for white LED back-light driving.

When LCM is operated over $60^\circ C$ ambient temperature, the I_{LED} of the LED back-light should be adjusted to 150mA max



6. BLOCK DIAGRAM



7. INTERFACE PIN ASSIGNMENT

Pin No	Symbol	Function
1	GND	Power Ground
2	GND	Power Ground
3	VCC	3.3V Power Supply for LCD
4	VCC	3.3V Power Supply for LCD
5	R0	Red Data 0 (LSB)
6	R1	Red Data 1
7	R2	Red Data 2
8	R3	Red Data 3
9	R4	Red Data 4
10	R5	Red Data 5
11	R6	Red Data 6
12	R7	Red Data 7 (MSB)
13	G0	Green Data 0 (LSB)
14	G1	Green Data 1
15	G2	Green Data 2
16	G3	Green Data 3
17	G4	Green Data 4
18	G5	Green Data 5
19	G6	Green Data 6
20	G7	Green Data 7 (MSB)
21	B0	Blue Data 0 (LSB)
22	B1	Blue Data 1
23	B2	Blue Data 2
24	B3	Blue Data 3
25	B4	Blue Data 4
26	B5	Blue Data 5
27	B6	Blue Data 6
28	B7	Blue Data 7(MSB)
29	GND	Power Ground
30	DCLK	Clock Signals
31	DISP	Display on/off (High: on, Low :off)
32	HSYNC	Horizontal SYNC signal.
33	VSYNC	Vertical SYNC signal
34	DENA	Data Enable signal (to settle the viewing area)
35	NC	No Connect
36	NC	No Connect
37	NC	No Connect
38	NC	No Connect
39	SC	Scan direction control (Low= Reverse, High= Normal)
40	GND	Power Ground
41	GND	Power Ground

42	LED C1	LED cathode 1
43	LED A1	LED anode 1
44	LED C2	LED cathode 2
45	LED A2	LED anode 2

Remark:

1. GND Pin must ground contact, can not be floating.
2. SC are controlled function

(L/R)	(U/D)	Function
1	0	Normally display
0	1	Left and Right opposite , Up and Down opposite

Pin definition of TP FPC:

Pin No	Symbol	Function
1	GND	Ground terminal.
2	SDA	I2C Interface
3	SCL	
4	VDD	Power Supply for TP controller
5	INT	IRQ Terminal
6	XRES	Terminal of Reset TP controller.

8. INTERFACE TIMING

8.1. LCD Interface

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	6	-	-	ns
HS hold time	T_{hhd}	6	-	-	ns
VS setup time	T_{vst}	6	-	-	ns
VS hold time	T_{vhd}	6	-	-	ns
Data setup time	T_{dsu}	6	-	-	ns
Data hold time	T_{dhd}	6	-	-	ns
DEN setup time	T_{esu}	6	-	-	ns
Source output settling time	T_{ST}	-	-	15	μ s
Source output loading R	R_{SL}	-	2	-	k Ω
Source output loading C	C_{SL}	-	60	-	pF
Repair OP output loading C	C_{RL}	-	150	-	pF
Repair OP output settling time	T_{RT}	-	-	15	μ s
POL output delay time	T_{DP}	-	-	40	ns

● Sync mode

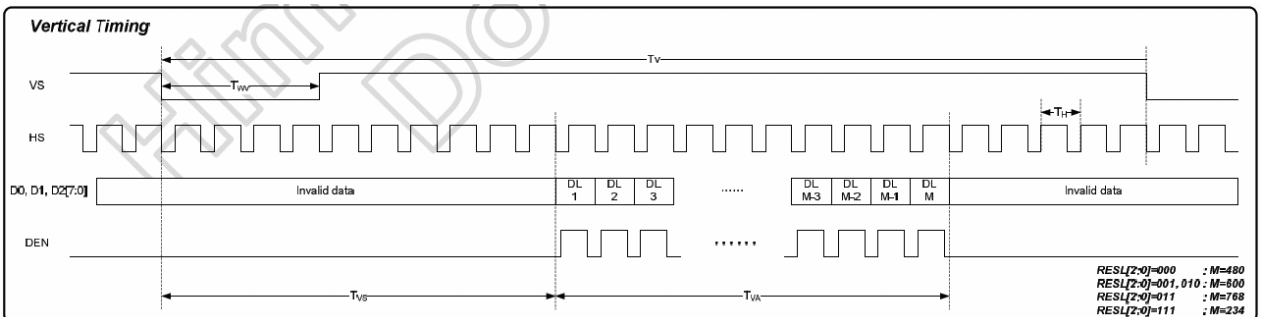
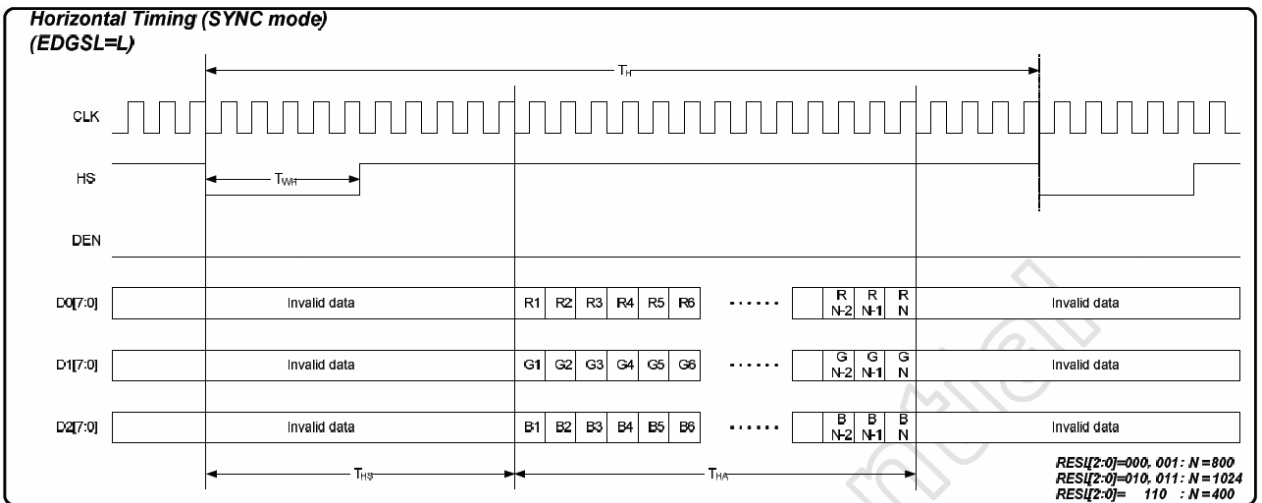
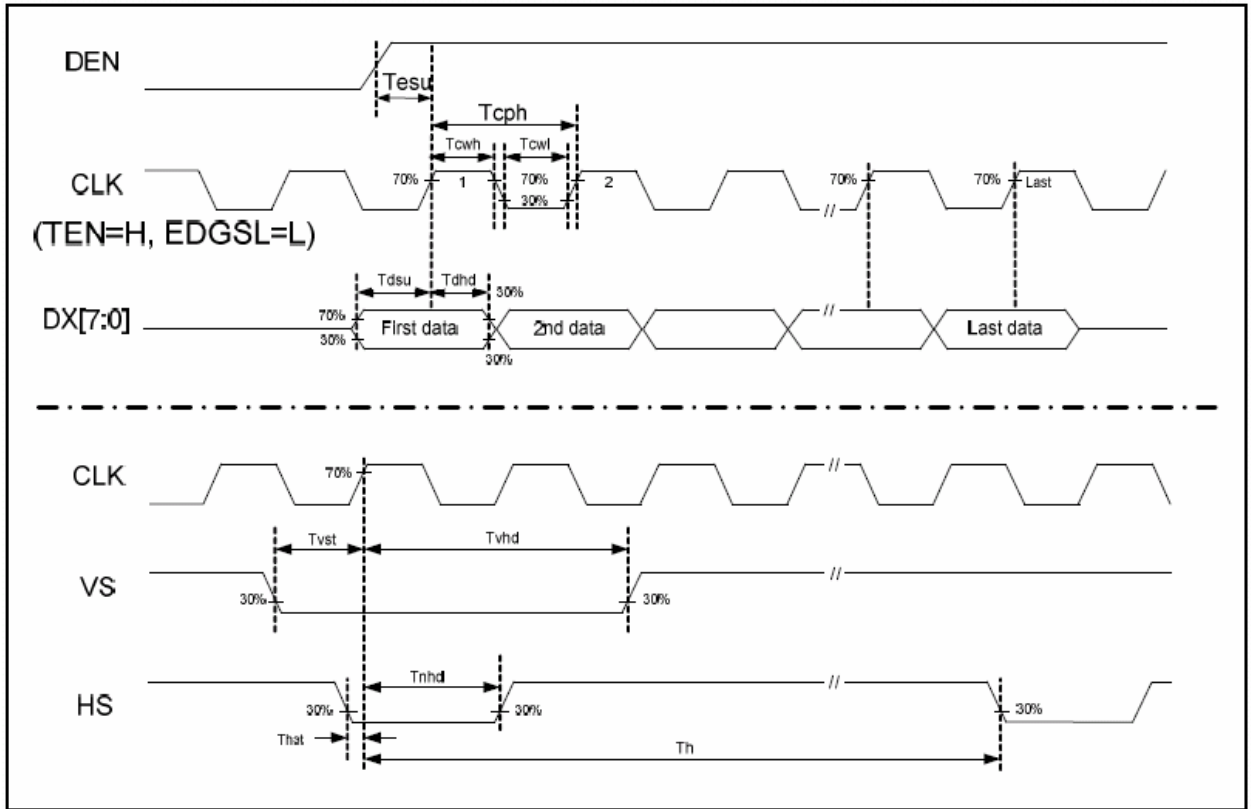
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	29.93	33.26	36.59	MHz
CLK period	T_{CPH}	-	30.06	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
HS period	T_H	930	1056	1057	T_{CPH}
HS pulse width	T_{WH}	1	128	-	T_{CPH}
HS-first horizontal data time	T_{HS}	STHD[7:0]+88			T_{CPH}
HS Active Time	T_{HA}	-	800	-	T_{CPH}
VS period	T_V	490	525	526	T_H
VS pulse width	T_{WV}	1	2	-	T_H
VS-DE time	T_{VS}	STVD[6:0]+8			T_H
VS Active Time	T_{VA}	-	480	-	T_H

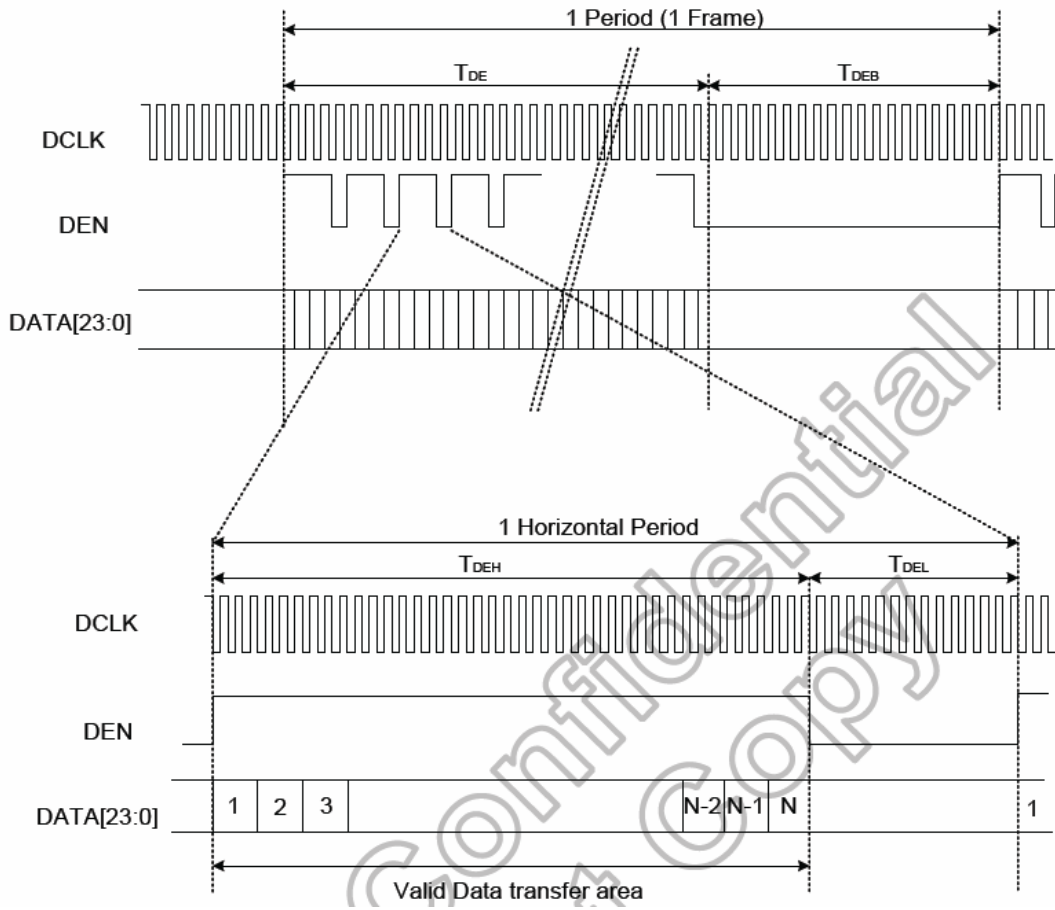
Note: (1) $T_{HS}+T_{HA}<T_H$

● DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	29.93	33.26	36.59	MHz
CLK period	T_{CPH}	-	30.06	-	ns
CLK pulse duty	T_{COWH}	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	-	$T_{DEH}+T_{DEL}$

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
OEV pulse width	T_{OEV}	-	150	-	T_{CPH}
CKV pulse width	T_{CKV}	-	133	-	T_{CPH}
DE(internal)-STV time	T_1	-	4	-	T_{CPH}
DE(internal)-CKV time	T_2	-	40	-	T_{CPH}
DE(internal)-OEV time	T_3	-	23	-	T_{CPH}
DE(internal)-POL time	T_4	-	157	-	T_{CPH}
STV pulse width	-	-	1	-	T_H

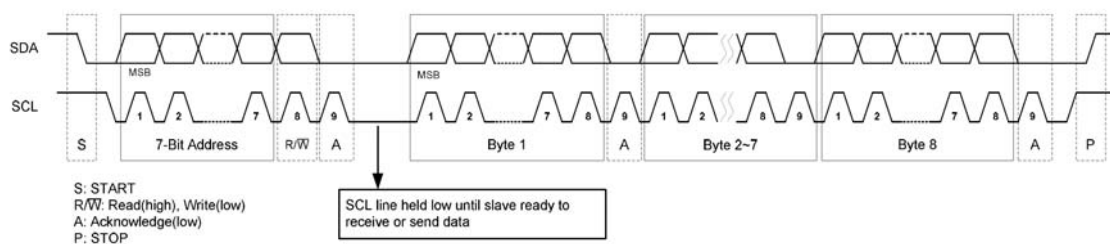
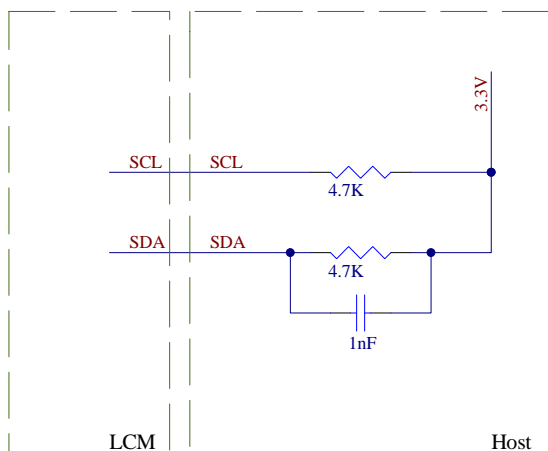




8.2.1 I2C Interface (T/P Controller)

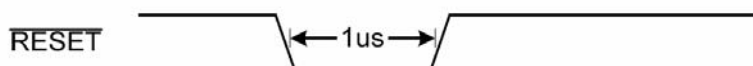
ST1332 equipped with I2C provide two wires, serial data (SDA) and serial clock (SCL), to carry information transfers at up to 400 kbit/s(Fast mode). ST1332 plays a slave role in I2C transfer. Both SDA and SCL are bidirectional lines, connected to IOVDD via pull-up resistors. All transactions begin with a START (S) and can be terminated by a STOP (P). 7-Bit address follows START to recognize device. Each byte is 8-bit length and followed by an acknowledge bit. A HIGH to LOW transition on the SDA line while SCL is HIGH defines a START condition. A LOW to HIGH transition on the SDA line while SCL is HIGH defines a STOP condition. A LOW to HIGH transition on the SDA line while SCL is HIGH defines a START condition. A LOW to HIGH transition on the SDA line while SCL is HIGH defines a STOP condition.

The data on the SDA line must be stable during the HIGH period of the clock. The HIGH or LOW state of the data line can only change when the clock signal on the SCL line is LOW.

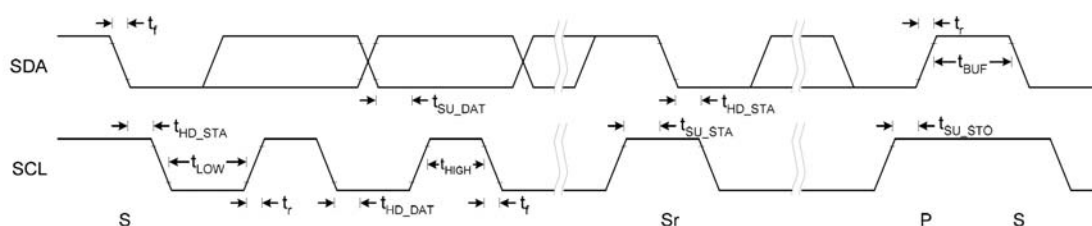


- * 7-Bit Address=0x55
- * Read mode only.

Master can reset ST1332 through RESET pin. RESET pin is low active and needs hold low for 1us to take effect.



8.2.2 AC Timing of I2C Interface



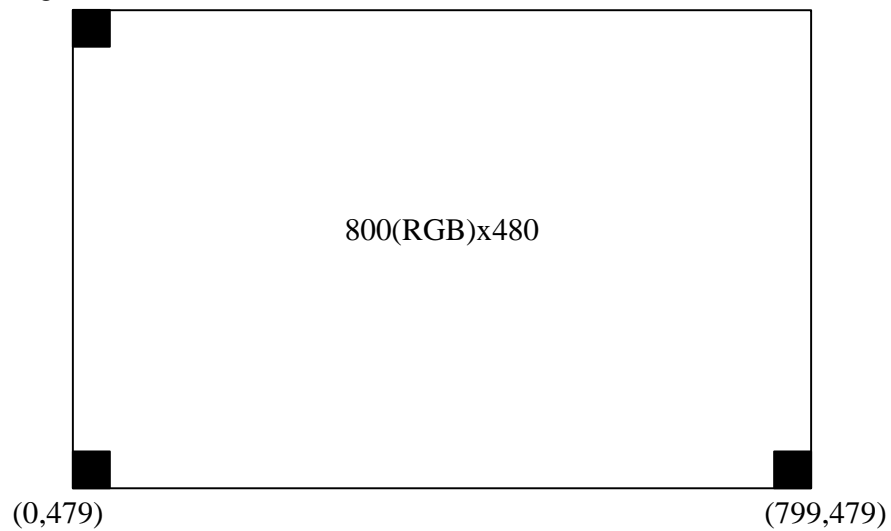
Conditions: VDD = IOVDD = 3.3V, GND = 0V, T_A = 25°C

Symbol	Parameter	Rating			Unit
		Min.	Typ.	Max.	
f _{SCL}	SCL clock frequency	0	-	400	kHz
t _{LOW}	Low period of the SCL clock	1.3	-	-	us
t _{HIGH}	High period of the SCL clock	0.6	-	-	us
t _f	Signal falling time	-	-	300	ns
t _r	Signal rising time	-	-	300	ns
t _{SU_STA}	Set up time for a repeated START condition	0.6	-	-	us
t _{HD_STA}	Hold time (repeated) START condition. After this period, the first clock pulse is generated	0.6	-	-	us
t _{SU_DAT}	Data set up time	100	-	-	ns
t _{HD_DAT}	Data hold time	0	-	0.9	us
t _{SU_STO}	Set up time for STOP condition	0.6	-	-	us
t _{BUF}	Bus free time between a STOP and START condition	1.3	-	-	us
C _b	Capacitive load for each bus line	-	-	400	pF

8.2.3 TP controller register table

Reg. Addr.	Name	Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x10	Proximity/finger	Reserve				Fingers			
0x11	Gesture	Reserve							
0x12	XY0 Coord. (High byte)	Valid	X0_H		X		Y0_H		
0x13	X0 Coord. (Low byte)	X0_L							
0x14	Y0 Coord. (Low byte)	Y0_L							
0x15	XY1Coord. (High byte)	Valid	X1_H		X		Y1_H		
0x16	X1 Coord. (Low byte)	X1_L							
0x17	Y1 Coord. (Low byte)	Y1_L							

Origin (0,0)



8.2.4 Sample Code

```
if((ReadINT()==0)
{
{
I2C_EE_BufferRead(pbuffer,0xAB,8); // Device Addr.=0x55
PCT_Z[0]=(u16)((u16)(pbuffer[0])); // Register 0x10
PCT_Z[1]=(u16)((u16)(pbuffer[1])); // Register 0x11
PCT_Z[2]=(u16)((u16)(pbuffer[2])); // Register 0x12
PCT_Z[3]=(u16)((u16)(pbuffer[3])); // Register 0x13
PCT_Z[4]=(u16)((u16)(pbuffer[4])); // Register 0x14
PCT_Z[5]=(u16)((u16)(pbuffer[5])); // Register 0x15
PCT_Z[6]=(u16)((u16)(pbuffer[6])); // Register 0x16
PCT_Z[7]=(u16)((u16)(pbuffer[7])); // Register 0x17

if (PCT_Z[2]>0x007F)
{
PCT_Z[8]=(u16)((u16)((pbuffer[2]&0x0070)<<4|pbuffer[3]));
PCT_Z[9]=(u16)((u16)((pbuffer[2]&0x0007)<<8|pbuffer[4]));
}

if (PCT_Z[5]>0x007F)
{
PCT_Z[10]=(u16)((u16)((pbuffer[5]&0x0070)<<4|pbuffer[6]));
PCT_Z[11]=(u16)((u16)((pbuffer[5]&0x0007)<<8|pbuffer[7]));
}
PCT_X[0]=PCT_Z[8]; // Coord.X0
PCT_Y[0]=PCT_Z[9]; // Coord.Y0
PCT_X[1]=PCT_Z[10]; // Coord.X1
PCT_Y[1]=PCT_Z[11]; // Coord.Y1
}
}
```

9. DISPLAYED COLOR AND INPUT DATA

DATA SIGNAL

COLOR		INPUT DATA																							
		R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
MSB							LSB	MSB							LSB	MSB								LSB	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	1	1	1	1	1	1
RED	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(1)	0	0	0	0	0	0	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	0	0	0	0	0	0	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

10. RELIABILITY

Test Item	Test Conditions	Note
High Temperature Operation	60±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
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 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).

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. USE PRECAUTIONS

11.1. 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 benzene 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.

11.2. 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. $1M\Omega$ 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.

11.3. 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.

11.4. 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 drive 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: 0.2VCC or less and H level: 0.8VCC 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.

11.5. 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) 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.
- 3) AMIPRE will provide one year warranty for all products and three months warrantee for all repairing products.

