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-800480SKTMQW-T00
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

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1 INTRODUCTION

Ampire 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, timing controller and capacitive touch panel. This TFT-LCD has a high resolution (800(R.G.B) X 480) and can display up to 262,144 colors .

1-1. Features

- 7” WVGA (16:9 diagonal) configuration
- LCM Input interface voltage : 3.3V
- Data enable mode
- Capacitive touch panel :
- Touch controller: ST1633-N48C, I2C interface.

1-2. Applications

- Portable TV
- Car user DVD
- Industrial application
- HMI (Human machine interface)

2 PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	800RGB (W) x 480(H)	Dots
Active area	152.4 (W) x 91.44 (H)	mm
Pixel pitch	0.1905 (W) x 0.1905 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	184.0(W)x128.0(H)X7.59(T)	mm
Brightness	300 nit	cd/m^2
Contrast ratio	400 : 1	
Backlight unit	LED	
Display color	262,144	Colors

3 ABSOLUTE MAX. RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage for LCD	Vcc	-0.5	6.0	V
Signal input voltage	DCLK DE R0~R5 G0~G5 B0~b5	-0.5	VCC+0.3	V
Operation Temperature	Top	-20	70	℃
Storage Temperature	Tstg	-30	80	℃

The following values are maximum operation conditions , If exceeded , it may cause faulty operation or damage

4 ELECTRICAL CHARACTERISTICS

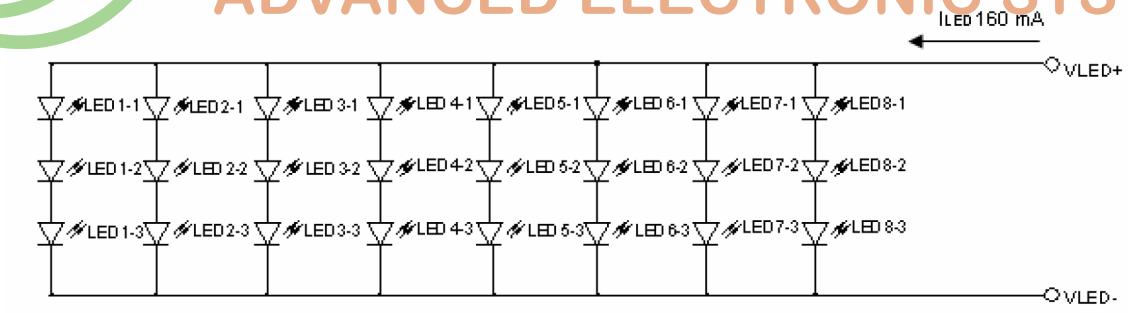
4-1 TFT LCD Module voltage

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
Power Supply Voltage For LCD		Vcc	3.0	3.3	3.6	V	
Power Supply Current For LCD		Icc	-	200	260	mA	VCC=3.3V
LED Backlight Voltage		V_{BL}	-	9.9	-	V	For reference
LED Backlight Current		I_{BL}	-	160	-	mA	
Logic Input Voltage	Input Voltage	V_{IN}	0	-	Vcc	V	
	Threshold Voltage(High)	V_{TH}	0.7Vcc	-	Vcc	V	
	Threshold Voltage(Low)	V_{TL}	0	-	0.3Vcc	V	

4-2 LED Driving Conditions

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
LED Backlight Voltage	V_{BL}	-	9.9	-	V	Note1
LED Backlight Current	I_{BL}	-	160	-	mA	
LED Life Time	-	10000	20000		Hr	Note2

Note 1 : There are 8 Groups LED shown as below , V_{LED}=9.9V , I_{LED}=160mA.



Note 2 : Brightess to be decreased to 50% of the initial value.

5 INTERFACE

5-1. LCM Interface

Pin no	Symbol	Function
1	GND	Ground
2	GND	Ground
3	NC	No connection
4	VCC	Power supply for Digital Circuit
5	VCC	Power supply for Digital Circuit
6	VCC	Power supply for Digital Circuit
7	VCC	Power supply for Digital Circuit
8	NC	No connection
9	DE	Data Enable Timing Signal
10	GND	Ground
11	GND	Ground
12	GND	Ground
13	B5	Blue data (MSB)
14	B4	Blue data
15	B3	Blue data
16	GND	Ground
17	B2	Blue data
18	B1	Blue data
19	B0	Blue data (LSB)
20	GND	Ground
21	G5	Green data (MSB)
22	G4	Green data
23	G3	Green data
24	GND	Ground
25	G2	Green data
26	G1	Green data
27	G0	Green data (LSB)
28	GND	Ground
29	R5	Red data (MSB)
30	R4	Red data
31	R3	Red data
32	GND	Ground
33	R2	Red data
34	R1	Red data
35	R0	Red data (LSB)
36	GND	Ground
37	GND	Ground
38	DCLK	Data Clock :Latch Data at Falling Edge
39	GND	Ground
40	GND	Ground

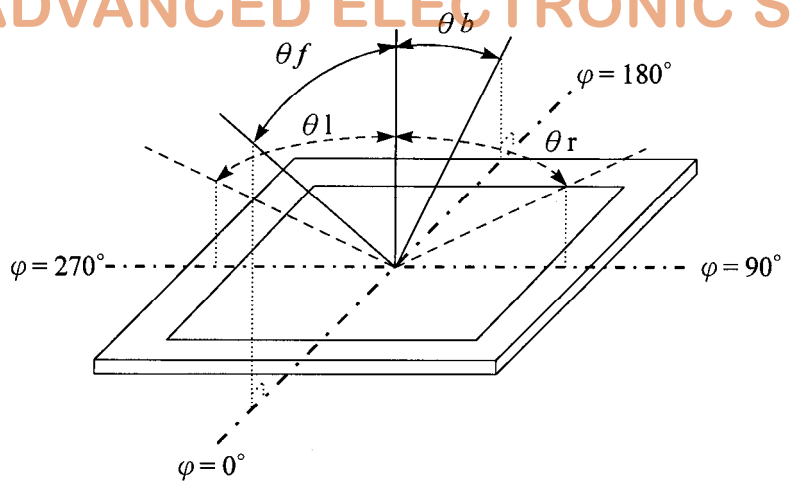
Note: User's connector part number is CF39402D0R0-NH manufactured by Cvilux. or equivalent.

6 OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Front	θ f	CR≧10	50	60	--	deg.	(1)(2)(3)
	Back	θ b		60	70	--		
	Left	θ l		60	70	--		
	Right	θ r		60	70	--		
Contrast ratio		CR	Θ=Φ=0°	250	400	--	--	(1)(3)
Response Time		T_r	Θ=Φ=0°	--	5	10	ms	(1)(4)
		T_f		--	11	16	ms	(1)(4)
Color chromaticity	White	Wx		0.249	0.299	0.349	--	(1)
		Wy		0.278	0.328	0.378		
Luminance		L	Θ=Φ=0°	240	300	--	cd/m^2	(1)(5)
Luminance Uniformity		ΔL	Θ=Φ=0°	70	--	--	%	(1)(5)(6)

Note 1: Ta=25°C. To be measured on the center area of panel after 10 minutes operation.

Note 2: Definition of Viewing Angle

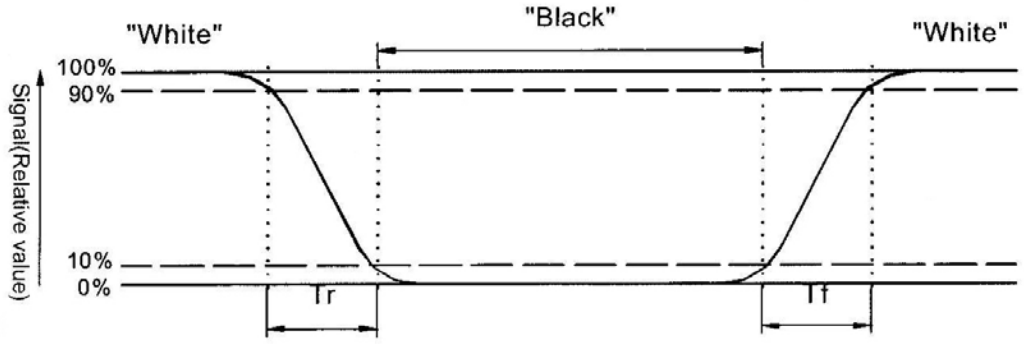


Note 3: Definition of contrast ratio:
Contrast ratio is calculated with the following formula.

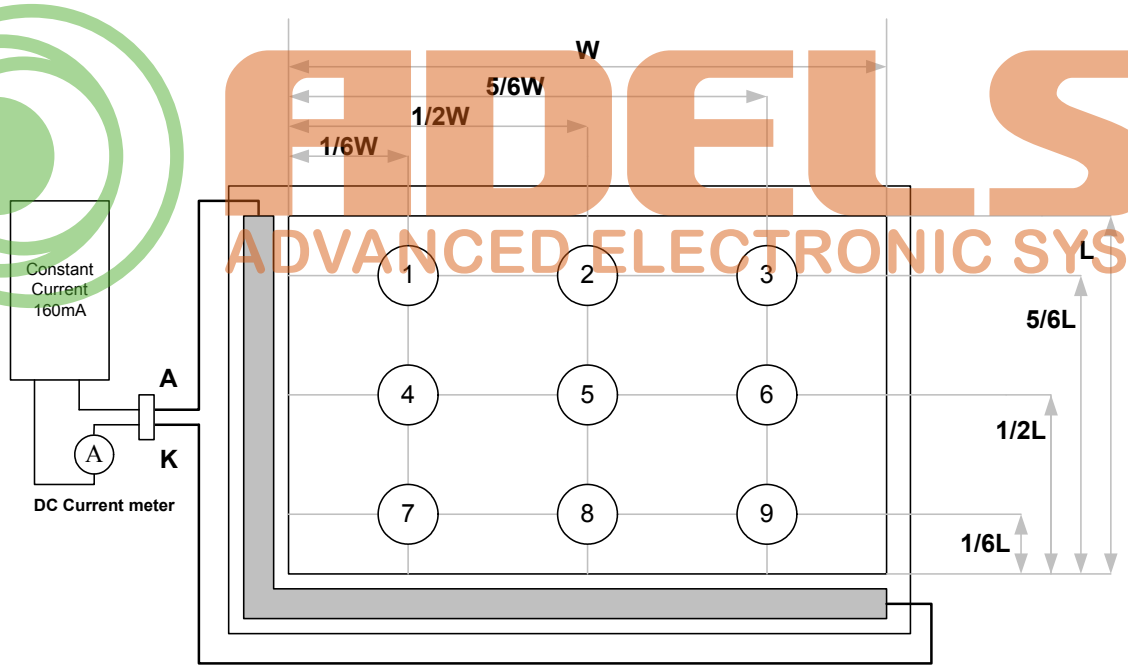
$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

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.



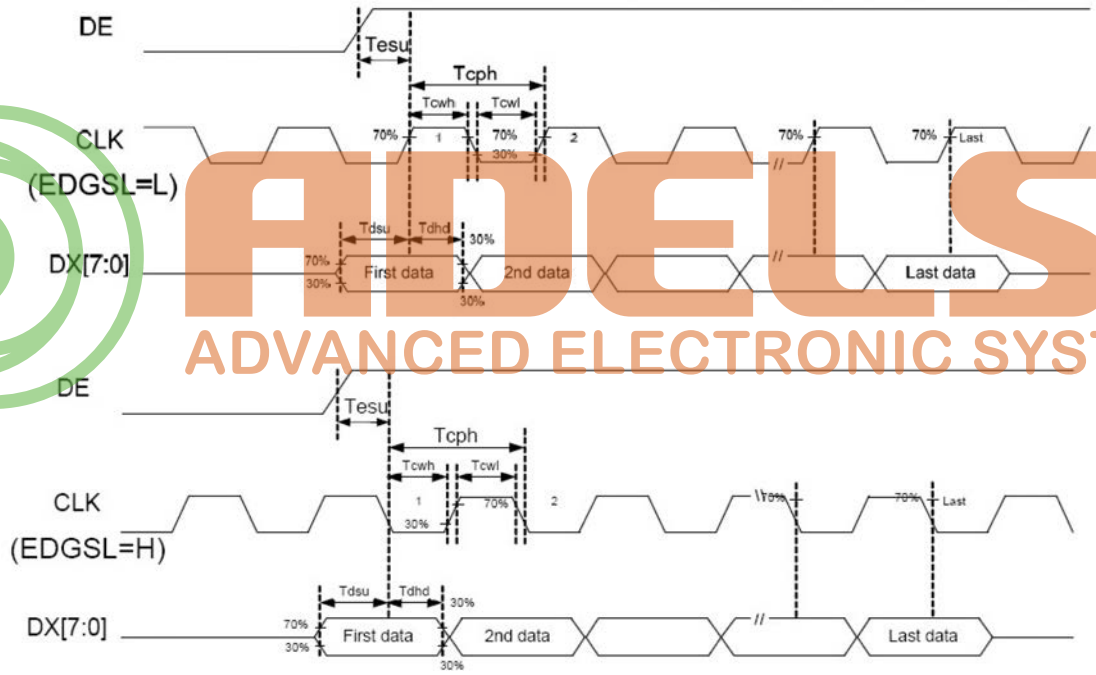
Note 6 : Definition of Luminance Uniformity

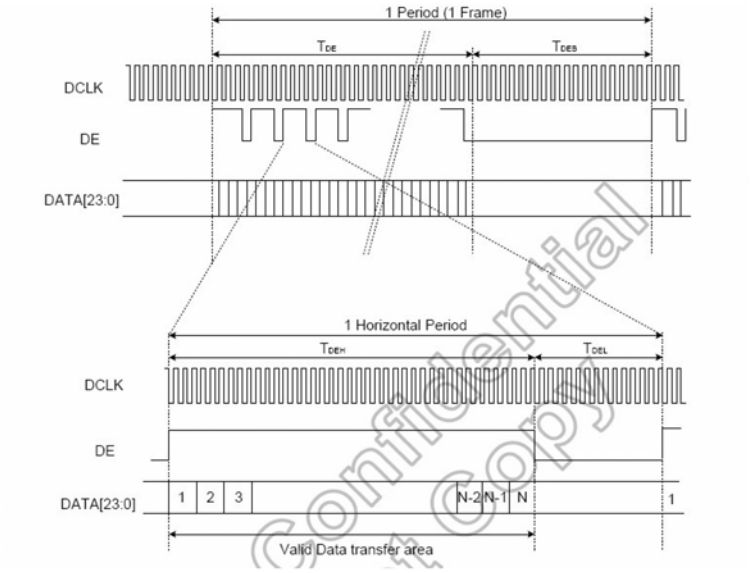
$$\Delta L = [\ L(\text{min.}) \text{ of 9 points} / L(\text{max.}) \text{ of 9 points}] \times 100\%$$

7 INPUT SIGNAL (DE ONLY MODE)

Parameter	Symbol	Rating			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_{CPH}		33.26		MHz
CLK period	T_{CPH}		30.06		ns
CLK pulse duty	T_{CWH}	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	-	$T_{DEH}+T_{DEL}$

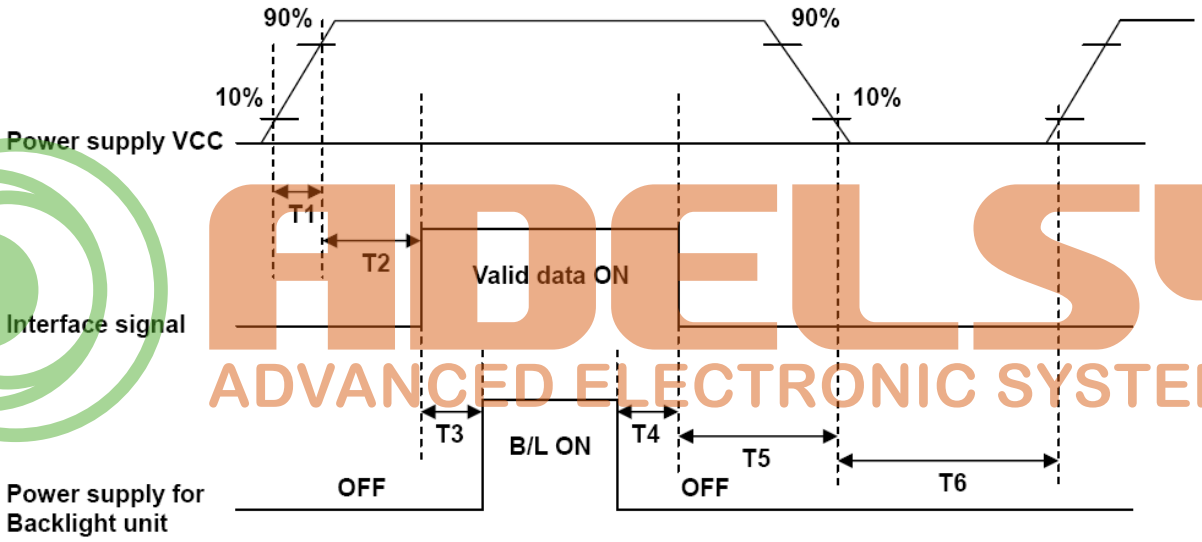
Note：We suggest using the typical value, so it can have better performance.





ief version

Power Sequence



Parameter	SPEC.			Unit
	Min.	Typ.	Max.	
T1	1		2	ms
T2	0	60		ms
T3	200			ms
T4	200			ms
T5	1			ms
T6	1000			ms

8 Touch Panel SPECIFICATION

8.1 Basic Characteristic

Specify the normal operating condition
(DGND=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VIN	3.0	3.3	3.6	V	
Low Level Input Voltage	VIL	0	--	0.8	V	1
High Level Input Voltage	VIH	0.8*VIN	--	VIN	V	1
Power Consumption	I_{VIN}		33		mA	

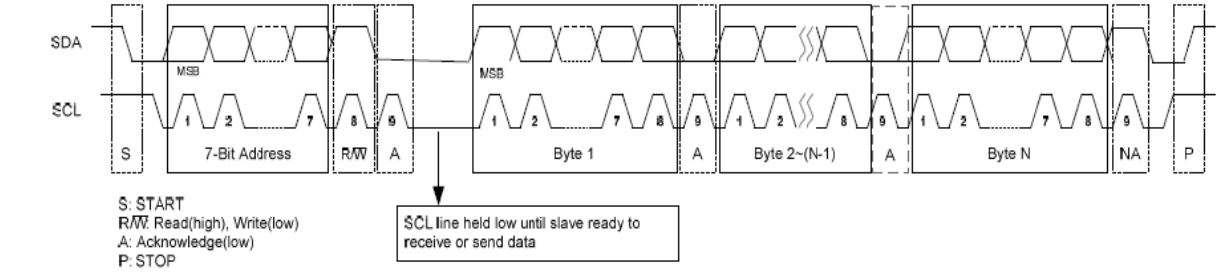
Note 1: SDA , SCL ,RESET

8.2 Interface

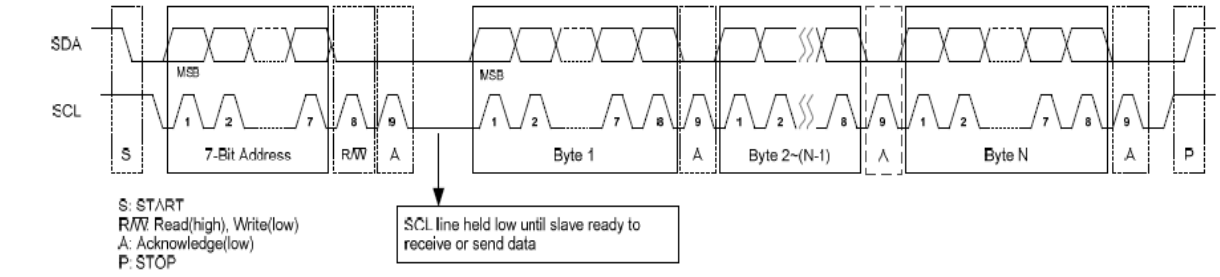
CN6		
Pin No.	Symbol	Function
1	DGND	USB POWER GND
2	SDA	I2C DATA
3	SCL	I2C CLOCK
4	VDD	3.3V
5	INT	Interrupt Request pin. Active Low
6	RST	Reset pin to Master Chip

8.3 I2C Slave Interface

Read



Write



8.4 Default I2C Address

I2C address is default to **0x55** (7-bits address) for Sitronix Touch IC. If the I2C address is conflict with another I2C device's address on same bus, user can change I2C address by TTK PC Utility.

8.5 Register Read

For reading register value from I2C device, host has to tell I2C device the *Start Register Address* before reading corresponding register value.

I2C Start	I2C Header (W)	Start Reg. Addr. (a)	I2C Stop	I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop

Sitronix Touch IC I2C host interface protocol supports Repeated Register Read. That is, once the Start Register Address has been set by host, consequent I2C Read(R) transactions will directly read register values starting from the Start Register Address without setting address first, as shown in Figure

I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop	I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop

8.6 Register Write

For writing register to I2C device, host has to tell I2C device the Start Register Address in each I2C Register Write transaction. Register values to the I2C device will be written to the address starting from the Start Register Address described in Register Write I2C transaction as shown in Figure

I2C Start	I2C Header (W)	Start Reg. Addr. (a)	Value to Reg(a)	Value to Reg(a+1)	…	Value to Reg(a+n)	I2C Stop

8.7 SAMPLE CODES

```
typedef struct {
        u8 y_h: 3,
        reserved: 1,
        x_h: 3,
        valid: 1;
        u8 x_l;
        u8 y_l;
        u8 z;
    } xyz_data_t;

typedef struct {
        u8 fingers: 4,
        reserved: 4;
        u8 keys;
        xyz_data_t xyz_data[10];
} stx_report_data_t;
```



```
// I2C Master sends count bytes data stored in buf to I2C Slave.
// I2C package: | S | I2C Addr | W | Data (buf) | P |
extern int i2c_master_send(const char *buf, int count);

// I2C Master reads count bytes data to buf from I2C Slave.
// I2C package: | S | I2C Addr | R | Data (buf) | Nak | P |
extern int i2c_master_recv(char *buf, int count);
```

8.8 Read XY Coordinates

The function, get_coordinates(), reads XY Coordinate registers from I2C Slave, extracts XY information from data buffer and returns to upper layer. This function shall be called from ISR each time when host receives and INT from device.

```
static int get_coordinates(u8 *count, u32 *x0, u32 *y0, u32 *x1, u32 *y1)
{
        u8 buf[42];
        stx_report_data_t *pdata;
        int ret = 0;
        *count = 0; // Set point detected count to 0.
        if (i2c_master_recv(buf, sizeof(buf))) // Read Coordinates from default Reg. address 0x10.
        goto err;
        pdata = (stx_report_data_t *) buf;
        if (pdata->fingers) {
        if (pdata->xy_data[0].valid) {
        *x0 = pdata->xy_data[0].x_h << 8 | pdata->xy_data[0].x_l;
        *y0 = pdata->xy_data[0].y_h << 8 | pdata->xy_data[0].y_l;
(*count)++;
        }
        if (pdata->xy_data[1].valid) {
        *x1 = pdata->xy_data[1].x_h << 8 | pdata->xy_data[1].x_l;
        *y1 = pdata->xy_data[1].y_h << 8 | pdata->xy_data[1].y_l;
(*count)++;
        }
}
        err:
        return ret;
}
```


Coordinate

9. RELIABILITY 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 50cycle(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 : 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.

10. USE PRECAUTIONS

10-1 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.

(1) 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.

10-2 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

10-3 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.

10-4 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.

10-5 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 warrantee for all products and three months warrantee for all repairing products..

11. OUTLINE DIMENSION