

A Brighter Solution

AMP DISPLAY INC.

SPECIFICATIONS

CUSTOMER	
CUSTOMER PART NO.	
AMP PART NO.	AM-800600M2TNQW-TB0H
APPROVED BY	
DATE	

Approved For Specifications

Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2010/7/29	--	New Release	Kokai

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 and **Surface Capacitor Touch Panel**. 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, LED Driver IC, **Surface Capacitor Touch Panel and Surface Capacitor Touch Panel controller**.
- (2) LCD type : Transmissive , Normally White
- (3) Number of the Colors : 262K colors (R,G,B 6 bit digital each)
- (4) TFT Display interface : **TTF RGB Interface**.
- (5) Surface capacitor Touch Panel (SCT) : **SPI**
- (6) LCD Power Supply Voltage : 3.3V power input for TFT panel and SCT touch panel controller.
- (7) Build-in LED Driver IC (VLED=5V).
- (7) ROHS compliant.

2 PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	800RGB (W) x 600(H)	dots
Active area	170.40 (W) x 127.80(H)	mm
Pixel pitch	213 (W) x 213 (H)	um
Color configuration	R.G.B -stripe	
Overall dimension	203.0(W) x 145.5(H) x 18.2(D)	mm
Weight	T.BD	g
Backlight unit	LED	
Display color	262K	colors

3 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Supply voltage range	VCC	-0.3	4	V	(1)
LED Driver Supply voltage range	VLED	-0.3	6.5	V	(1)
Voltage range at any terminal	VI	-0.3	VCC + 0.3	V	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tstg	-30	80	°C	

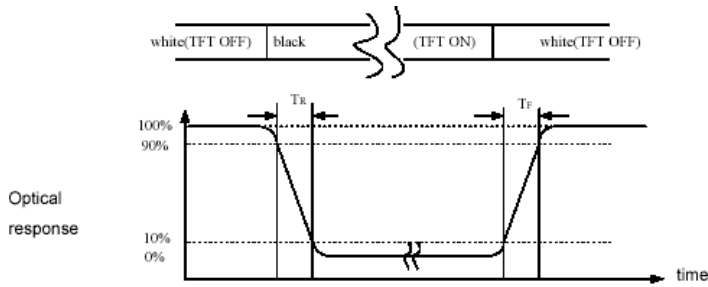
Note : All voltage values are with respect to the VSS terminals unless otherwise noted.

4 OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Response Time		$T_r + T_f$	$\Theta = \Phi = 0^\circ$	-	8	16	ms	(1)
Contrast ratio		CR		480	600	-	-	(2)(3)
Viewing Angle	Horizontal	Θ_L	$CR \geq 10$	65	75	-	Deg.	(5)
		Θ_R		65	75	-		
	Vertical	Θ_U		50	60	-		
		Θ_D		60	70	-		
Luminance (Center)		L	$\Theta = \Phi = 0^\circ$	250	315	--	cd/m ²	(3)(4) IL=60mA Ta=25°C
Luminance Uniformity		ΔL		-	70	-	%	(3)(4)
Color chromaticity	White	Wx		0.26	0.31	0.367		
		Wy		0.28	0.33	0.38		

NOTE :

- These items are measured by BM-5A(TOPCON) or CA-1000(MINOLTA) in the dark room (no ambient light)
- (1) Definition of Response Time (White-Black)



(2) Definition of Contrast Ratio

Measure contrast ratio on the below 5 points(refer to figure1,#1~#5point) and take the average value

Contrast ratio is calculated with the following formula :

$$\text{Contrast Ratio(CR)} = (\text{White})\text{Luminance of ON} \div (\text{Black})\text{Luminance of OFF}$$

(3) Definition of Luminance :

Measure white luminance on the center point (point 5) and take the value.

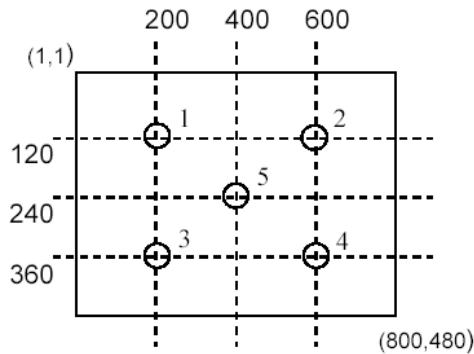


Fig.1 Measuring point

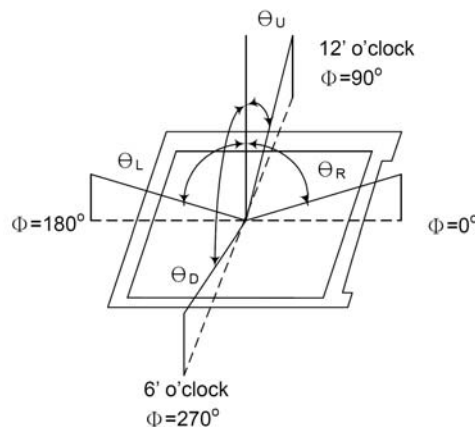
(4) Definition of Luminance Uniformity :

Measured Maximum luminance[L(MAX)] and Minimum luminance[L(MIN)] on the 5 points

Luminance Uniformity is calculated with the following formula :

$$\Delta L = [L(\text{MIN}) / L(\text{MAX})] \times 100\%$$

(5) Definition of Viewing Angle



5 ELECTRICAL CHARACTERISTICS

5.1 Power Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Logic Supply Voltage	VCC	3.0	3.3	3.6	V	
LED driver supply voltage	VLED	4.5	5.0	5.5	V	
Logic Input Voltage	VIH	VCC*0.7	--	VCC	V	(2)
	VIL	0	--	VCC*0.3	V	(2)
VCC Current	ICC		155		mA	(1)

Note1: Ta=25°C , Display pattern : All Black

Note2: U/D , L/R , DE ,HSYNC ,VSYNC , DCLK , R0~R5 , G0~ G5 , B0 ~ B5 , SCT_SCK , SCT_MOSI , SCT_MISO , SCT_CS , SCT_IRQ,

5.2 LED BACKLIGHT DRIVER UNIT

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	VLED	4.5	5.0	5.5	V	
Input Current	ILED	--	510	--	mA	100% PWM duty
ADJFrequency	Fpwm	100		200	Hz	
LED Forward Current	IF	--	60.6	63.63	mA	Ta=25°C
LED Forward Voltage	VF		35.1	43.8	V	IF=60.6mA, Ta=25°C
LED life time			50,000	-	Hr	IF=60.6mA, Ta=25°C

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

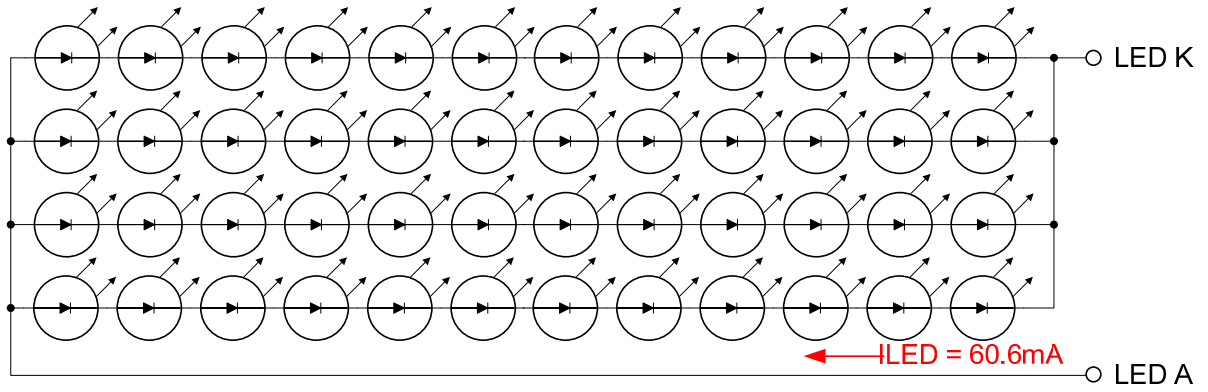
Note 2: VLED, ILED are defined for LED B/L. (100% duty of PWM dimming)

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

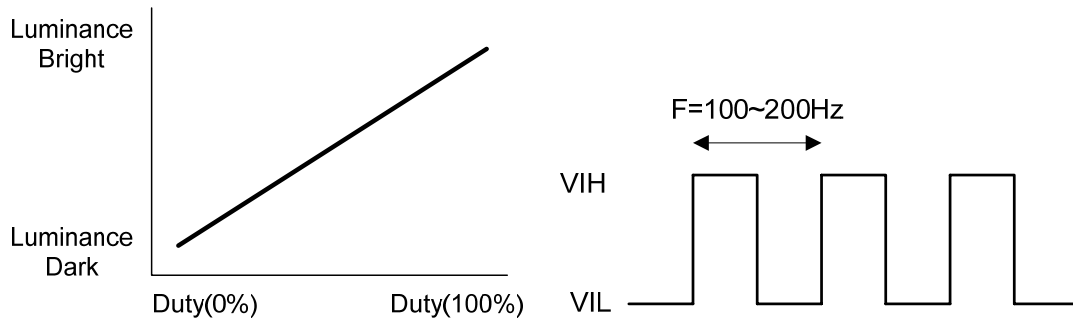
Note 4: If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

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.



PWM Dimming Control



6 INTERFACE

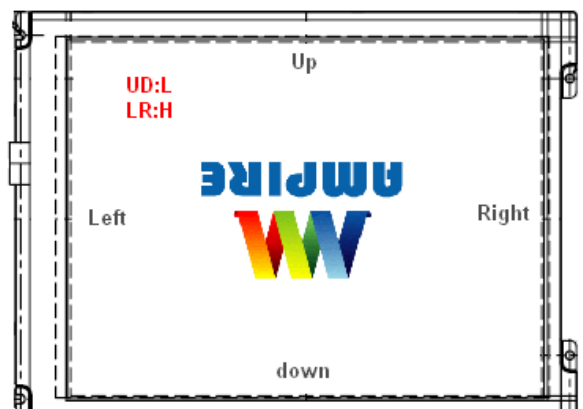
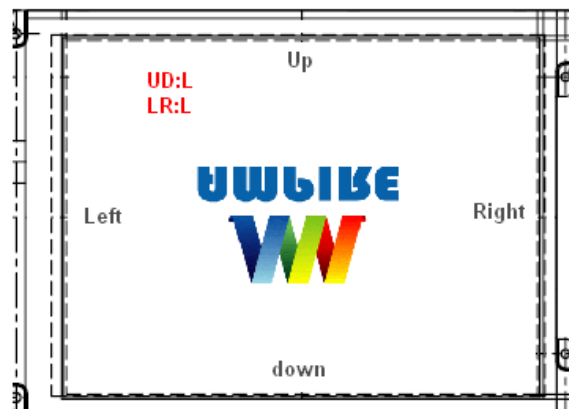
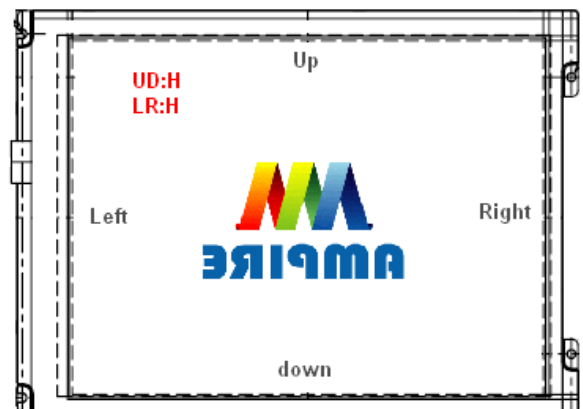
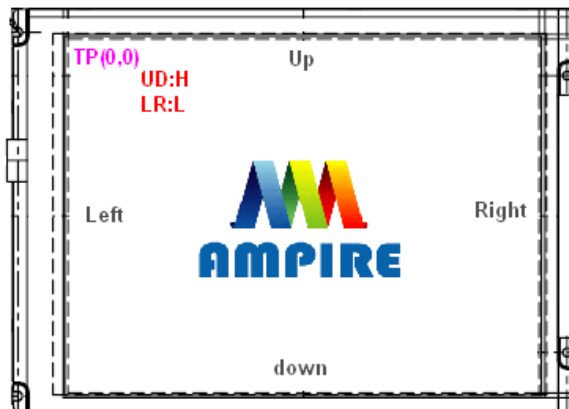
CN1 :

Pin No	Symbol	Function	Remark
1	U/D	Up or Down Display Control	Note1
2	(NC)	No connection	
3	Hsync(NC)	Horizontal SYNC. (Sync mode used)	
4	VLED	Power Supply for LED	
5	VLED	Power Supply for LED	
6	VLED	Power Supply for LED	
7	VCC	Power Supply for LCD & SCT	
8	Vsync(NC)	Vertical SYNC. (Sync mode used)	
9	DE	Data Enable	
10	SCT_SCK	SCT controller SPI clock input	
11	SCT_CS	SCT controller SPI Chip select. The SCT controller is active when the pin drives to low.	
12	ADJ	Adjust for LED Brightness	
13	B5	Blue Data 5 (MSB)	
14	B4	Blue Data 4	
15	B3	Blue Data 3	
16	Vss	Power Ground	
17	B2	Blue Data 2	
18	B1	Blue Data 1	
19	B0	Blue Data 0 (LSB)	
20	Vss	Power Ground	
21	G5	Green Data 5 (MSB)	
22	G4	Green Data 4	
23	G3	Green Data 3	
24	Vss	Power Ground	
25	G2	Green Data 2	
26	G1	Green Data 1	
27	G0	Green Data 0 (LSB)	
28	Vss	Power Ground	
29	R5	Red Data 5 (MSB)	
30	R4	Red Data 4	
31	R3	Red Data 3	
32	Vss	Power Ground	
33	R2	Red Data 2	
34	R1	Red Data 1	
35	R0	Red Data 0 (LSB)	
36	SCT_MISO	SCT controller SPI data output pin. Data is shifted on the falling edge of SCT_SCK. This output is high impedance when SCT_CS is High	
37	SCT_MOSI	SCT controller SPI data input pin. Serial Data input if SCT_CS is LOW, data is latched on	

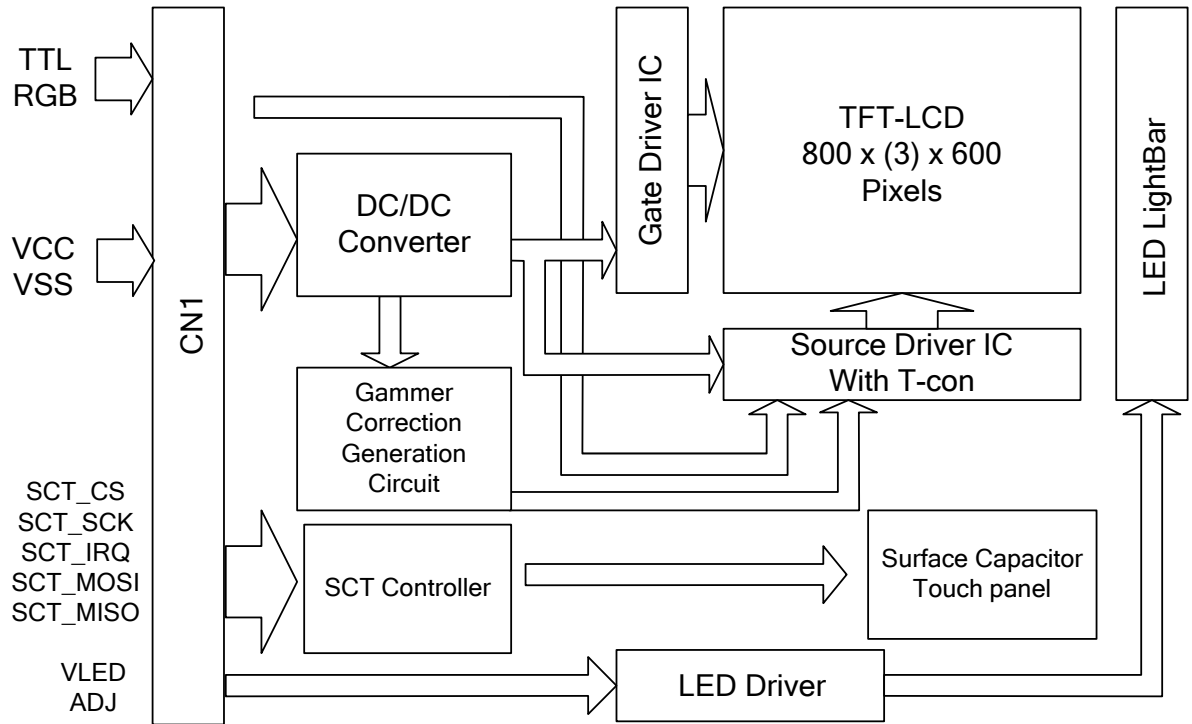
		rising edge of the SCT_SCK	
38	DCLK	Clock Signals	
39	SCT_IRQ	SCT controller Interrupt output pin. When SCT controller sense touch, the SCT_IRQ is low.	
40	L/R	Left or Right Display Control	Note1

(Note 1)

Setting of scan control input		Scanning direction
UD	LR	
VCC	VSS	Up to Down, Left to Right
VSS	VCC	Down to Up, Right to Left
VCC	VCC	Up to Down, Right to Left
VSS	VSS	Down to Up, Left to Right



7 BLOCK DIAGRAM



8 SURFACE CAPACITOR TOUCH PANEL

Feature	Description
Type	Capacitive
Input Method	Finger
Glass Thickness	2.8mm +/- 10% typical (glass only , not including tape , wire and solder if used)
Optical	Description
Light Transmittance	92% +/- 2% per ASTM D1003
Haze(AG)	7%
Gloss R'60 (AG type)	110 +/- 20GU
Durability	Description
Abrasion Test	Fit accuracy specification (Follow MIL-C-675C)
Adhesion Test	No deterioration, Tape test (Follow ASTM D3359)
Surface Scratch Hardness	More than 9H pre ASTM-D3363

9 SURFACE CAPACITOR TOUCH PANEL CONTROLLER PROTOCOL

The module is with surface capacitor touch panel (SCT) controller. The SCT controller report the X,Y position and pressure data via SPI interface. There SCT controller is a slave device in the SPI interface.

HOST MCU send the command via SCT_CS, SCT_MOSI, SCT_SCK pins. And the SCT controller output the data via SCT_CS, SCT_MISO, SCT_CSK pins.

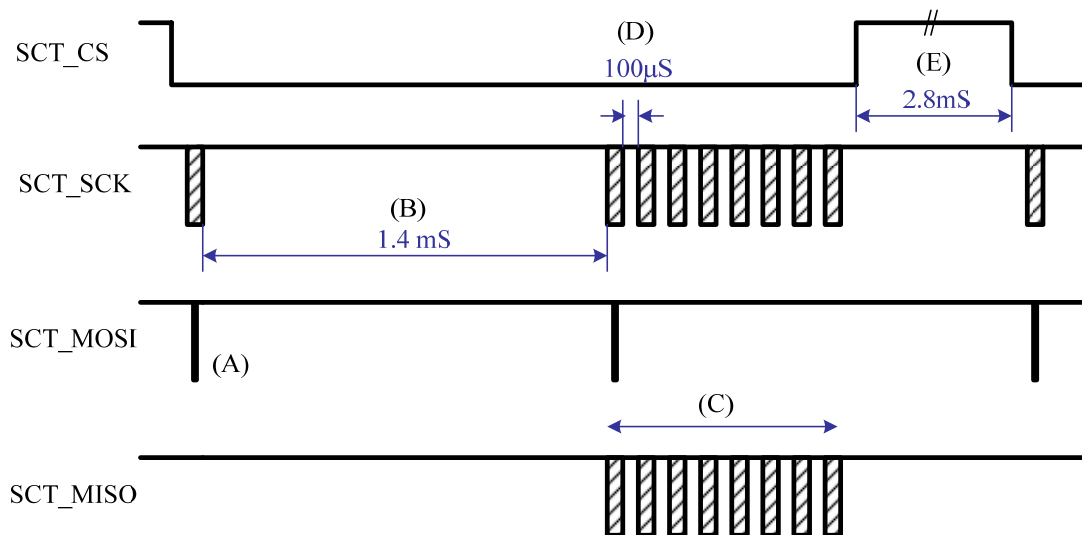
9.1 Read Mode Step

Command(W) + Read Data[0](R) + Read Data[1](R) + Read Data [2](R) ++ Read Data [7](R)

9.2 Command List :

0x10: Read X/Y position and pressure.

The complete protocol must includes 1 command (W) byte and 8 Read data (R) bytes.



Step (A): Host send the 0x10 command to SCT controller.

Step (B): Host must delay 1.4mS at least. The SCT controller takes time to calculate and prepare the data.

Step (C): The 1st read byte data is fixed 0x10.

Name:	Deception	Remark
Read data [0]	Command report	Normal 0x10
Read data [1]	Point Gesture	0x01: Touch , 0x00 No touch
Read data [2]	Pressure	
Read data [3]	Point X position Low Byte	(0~799)
Read data [4]	Point X position High Byte	
Read data [5]	Point Y position Low Byte	(0~599)
Read data [6]	Point X position High Byte	
Read data [7]	T.B.D	

Step (D): The delay time between n byte to n+1 byte is 100µS.

Step (E): If Host MCU needs to read the next protocol, the delay time 2.8mS is needed.

9.3 Sample code :

```
/******  
* Function Name   : u8* WT5750SPI_Read(u8 SPI_ID)  
* Description    : send SPI command and read 8 byte data  
* Input         : u8 SPI_ID ; normal 0x10  
* Return        : pointer to SCT out data arry.  
*               gbCommonDataBuffer [0] = Command report;  
*               gbCommonDataBuffer [1] = Point Gesture  
*               gbCommonDataBuffer [3] = Point Pressure;  
*               gbCommonDataBuffer [4] = Point X Position Low Byte;  
*               gbCommonDataBuffer [4] = Point X Position High Byte;  
*               gbCommonDataBuffer [5] = Point Y Position Low Byte;  
*               gbCommonDataBuffer [6] = Point Y Position High Byte;  
*               gbCommonDataBuffer [7] = T.B.D;  
*****/  
u8* WT5750SPI_Read(u8 SPI_ID)    //input: SPI_ID;  
{  
    u8 SPIData,i,j;  
    u16 ReadBit;  
    u8 gbCommonDataBuffer[8];  
  
    SET_DCLK;           // STC_SCK =0  
    CLR_TPCS1;         // SCT_CS=0  
  
    for(i=0;i<8;i++)    //clock 1~8 Write SPI_ID=0x10 to SCT controller  
    {  
        CLR_DCLK;      // Data Ready at Low  
        if(SPI_ID & 0x80)  
        {  
            SET_DI;  
        }  
        else  
        {  
            CLR_DI;  
        }  
        Delay_NOP1(1);  
        SET_DCLK;      //Data Latch at Rising Edge  
        Delay_NOP1(1);  
        SPI_ID<<=1;  
    }  
  
    Delay_NOP1(1400);   //Delay 1.4mS for SCT controller data ready  
  
    for(i=0;i<8;i++)  
    {  
        SPIData=0;  
        for(j=0;j<8;j++)  
        {  
            CLR_DCLK;  
            Delay_NOP1(1);  
  
            SET_DCLK;  
            Delay_NOP1(1);  
            if((ReadDI(ReadBit))>1)  
            {  
                SPIData=(SPIData<<1)+1;  
            }  
            else  
                SPIData<<1;  
        }  
    }  
}
```

```

    {
        SPIData=(SPIData<<1);
    }
}

    Delay_NOP1(100);          //Delay 100uS for SCT controller read byte delay
gbCommonDataBuffer[i]=SPIData;

}

    SET_DCLK;                //SCT_SCK=1
    SET_TPCS1;               //SCT_CS=1
return gbCommonDataBuffer;
}

/*****
* Function Name   : EXTI4_IRQHandler
* Description     : This function handles External interrupt Line 4 request.
* Input          : None
* Output         : None
* Return        : None
*****/
void EXTI4_IRQHandler(void)
{
    u16 LLCD_X,LLCD_Y , Temp_X , Temp_Y;
    u16 i;
    u8 *pDataBuffer , DataBuffer[8];

    EXTI_DeInit(); // Stop INT ,

Temp_X=0xFFFF; // Give the 1st comparetion data
Temp_Y=0xFFFF;

    while((ReadINT1())==0) // while SCT_IRQ=0
    {
        pDataBuffer=WT5750SPI_Read(0x10); // Get SCT X,Y data

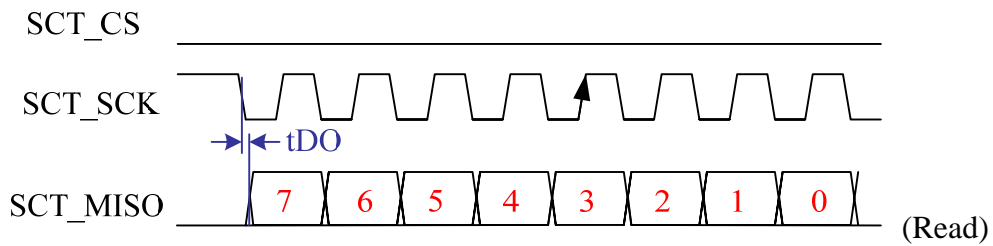
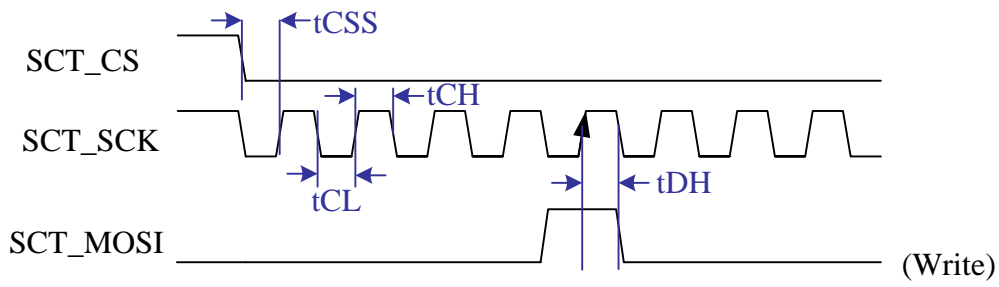
        for(i=0;i<8;i++)
        {
            DataBuffer[i]=*pDataBuffer;
            pDataBuffer++;
        }
        If (DataBuffer[0]==0x10) // Check the SPI data is correct or not
        {
            LLCD_X=((u16)((u16)(DataBuffer[4])<<8) + DataBuffer[3]);
            LLCD_Y=((u16)((u16)(DataBuffer[6])<<8) + DataBuffer[5]);

            If ( (LLCD_X==Temp_X) & (LLCD_Y==Temp_Y) ) // software debonce
            {
                GUI_Circle(LLCD_X, LLCD_Y, 10, rand()%0xffff);
            }

            Temp_X=LLCD_X;
            Temp_Y=LLCD_Y;
        }
        Delay_NOP1(200);
    }
}

```

9.4 SCT controller AC Timing :

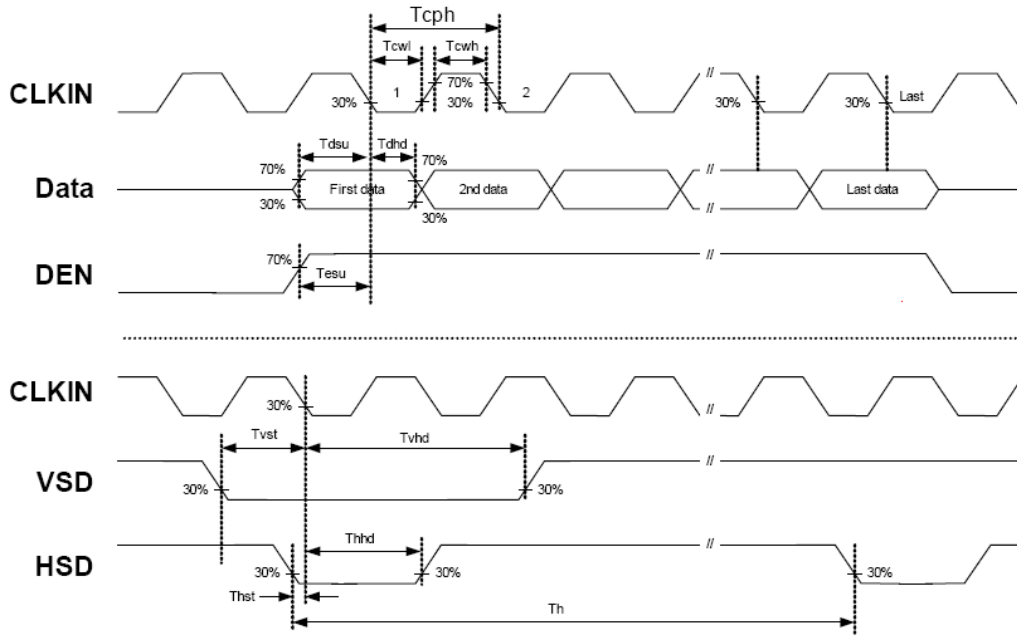


Item	DESCRIPTION	Min	TYP	MAX	unit	Remark
tCSS	SCT_CS falling to first SCT_SCK rising	1.5	--	--	μ S	
tCL	SCT_SCK Low	1.5	--	--	μ S	
tCH	SCT_SCK High	1.5	--	--	μ S	
tDH	SCT_MOSI Data Hold after DCLK High	T.B.D	1.5	--	μ S	
tDO	SCT_DCLK falling to SCT_MISO valid	--	--	T.B.D	nS	

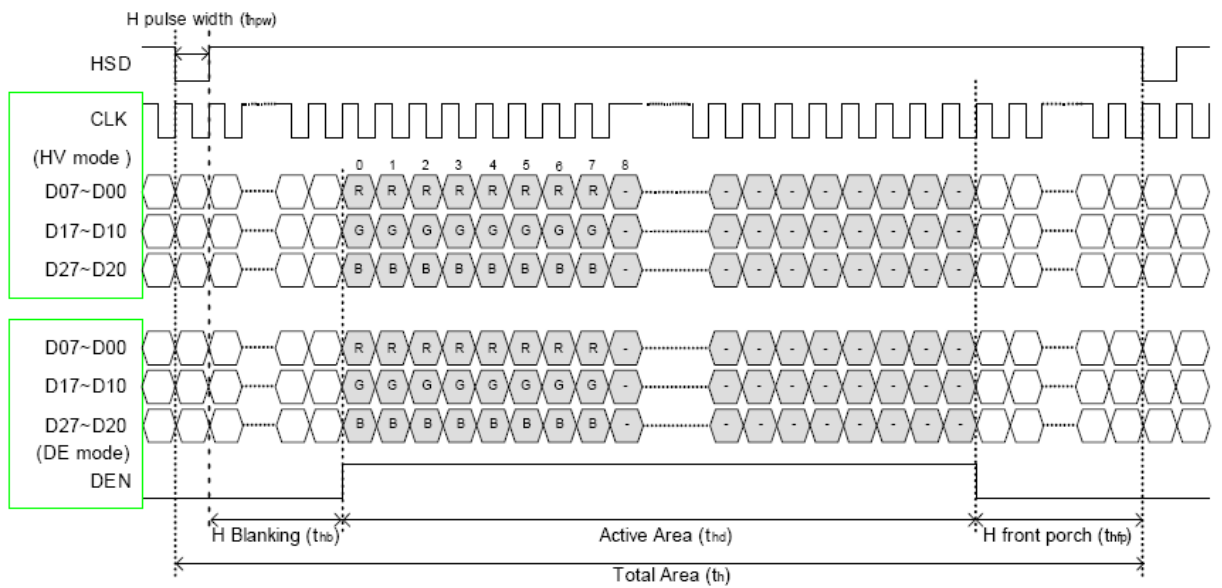
10 AC Timing characteristic

10.1 Timing characteristic of Panel

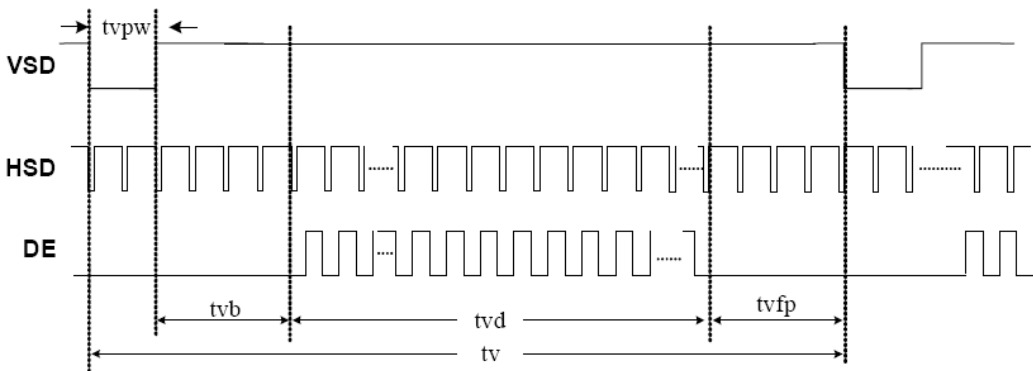
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tcph	20			ns	
DCLK frequency	fclk		24	26	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSD setup time	Tvst	8			ns	
VSD hold time	Tvhd	8			ns	
HSD setup time	Thst	8			ns	
HSD hold time	Thhd	8			ns	
Data setup time	Tdsu	8			ns	
Data hold time	Tdhd	8			ns	
DE 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

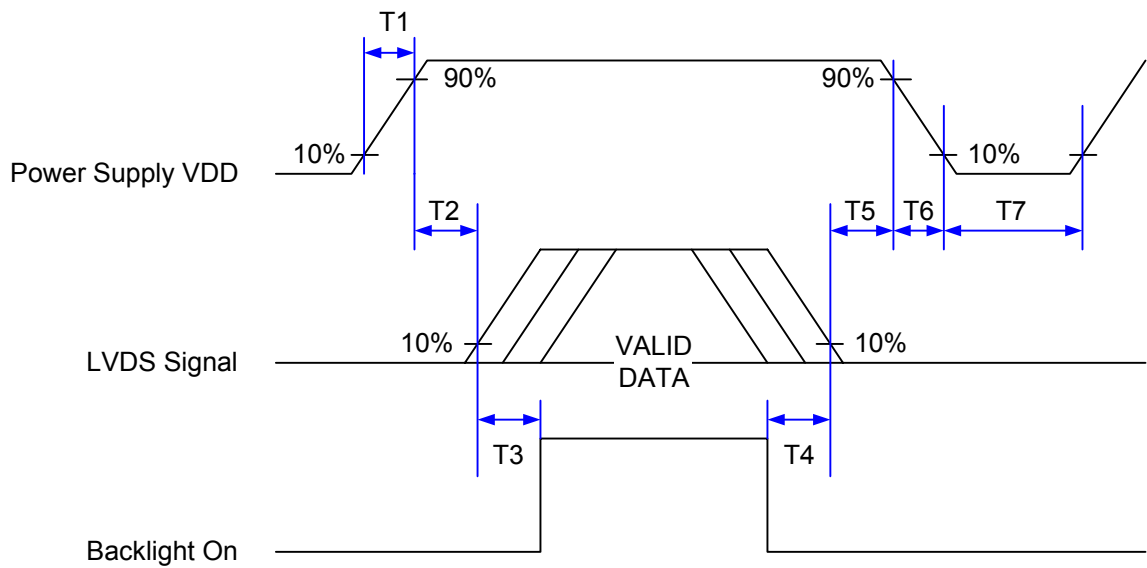


Horizontal display timing range



Vertical timing

8.3 Power ON/OFF Sequence



8.3.1 Power ON/OFF sequence timing

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

9 . QUALITY AND RELIABILITY

9.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $60 \pm 25\% \text{ RH}$.

9.2 SAMPLING PLAN

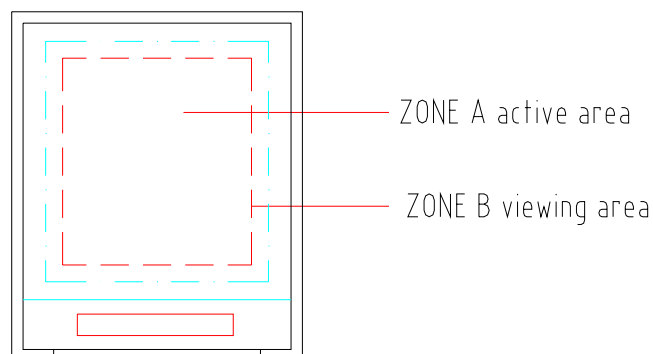
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

9.3 ACCEPTABLE QUALITY LEVEL

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

9.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.



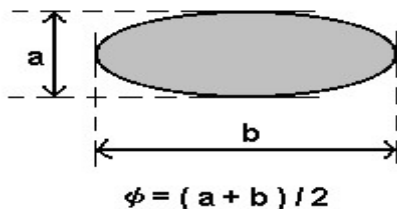
9.5 INCOMING INSPECTION STANDARD FOR TFT-LCD PANEL

DEFECT TYPE		LIMIT			Note	
VISUAL DEFECT	INTERNAL	SPOT	$\phi < 0.15\text{mm}$		Ignore	
			$0.15\text{mm} \leq \phi \leq 0.5\text{mm}$		$N \leq 4$	
			$0.5\text{mm} < \phi$		$N=0$	
		FIBER	$0.03\text{mm} < W \leq 0.1\text{mm}, L \leq 5\text{mm}$		$N \leq 3$	Note1
			$1.0\text{mm} < W, 1.5\text{mm} < L$		$N=0$	
		POLARIZER BUBBLE	$\phi < 0.15\text{mm}$		Ignore	Note1
			$0.15\text{mm} \leq \phi \leq 0.5\text{mm}$		$N \leq 2$	
			$0.5\text{mm} < \phi$		$N=0$	
		Mura	It' OK if mura is slight visible through 6%ND filter			
ELECTRICAL DEFECT	BRIGHT DOT		C Area	O Area	Total	Note3
			$N \leq 0$	$N \leq 2$	$N \leq 2$	Note2
	DARK DOT		$N \leq 2$	$N \leq 4$	$N \leq 4$	
	TOTAL DOT		$N \leq 4$			Note2
	TWO ADJACENT DOT		$N \leq 0$	$N \leq 0$	$N \leq 0$	Note4
	THREE OR MORE ADJACENT DOT		NOT ALLOWED			
	LINE DEFECT		NOT ALLOWED			

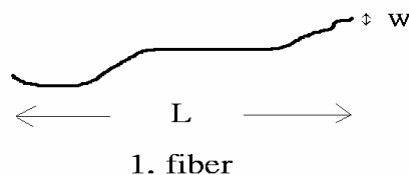
(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

(2) LITTLE BRIGHT DOT ACCEPTABLE UNDER 6 % ND-Filter

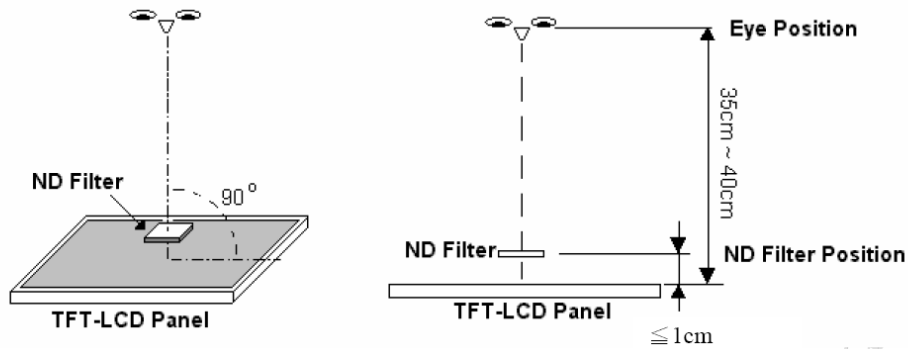
[Note1] W : Width[mm], L : Length[mm], N : Number, ϕ : Average Diameter



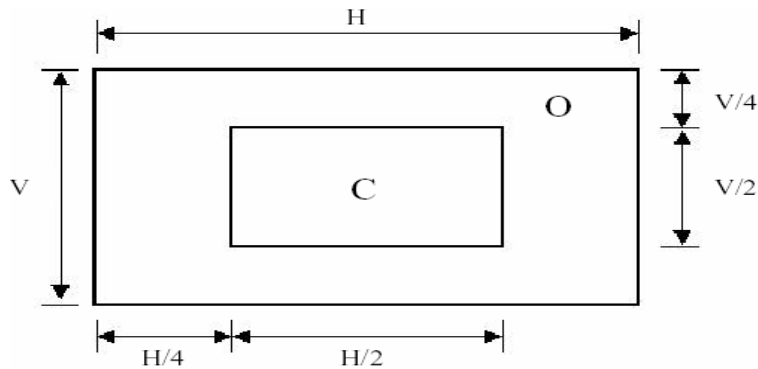
1. (White, black) Spot
2. Polarizer Bubble



[Note2] Bright dot is defined through 6% transmission ND Filter as following.



[Note3]

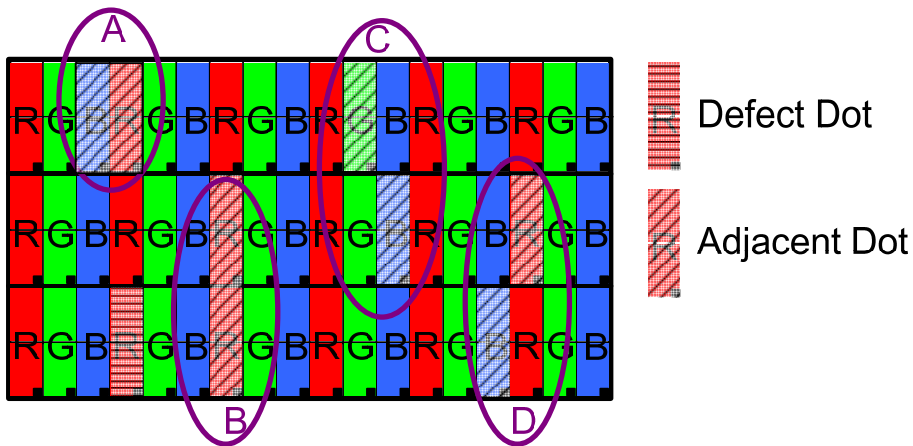


C Area: Center of display area

O Area: Outer of display area

[Note4]

Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.



- (1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.
- (2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

9.6 Reliability Test

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-20±3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-30±3°C , t=96 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	60 °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.

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.
- 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.

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. 1M Ω 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 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: 0.2V_{dd} or less and H level: 0.8V_{dd} 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) 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.

11. OUTLINE DIMENSION

