HTG128128Z

LCD Module User Manual

Shenzhen HOT Display Technology Co., Ltd.

Rev.	Descriptions	Date
01	Prelimiay Release	2010-05-21

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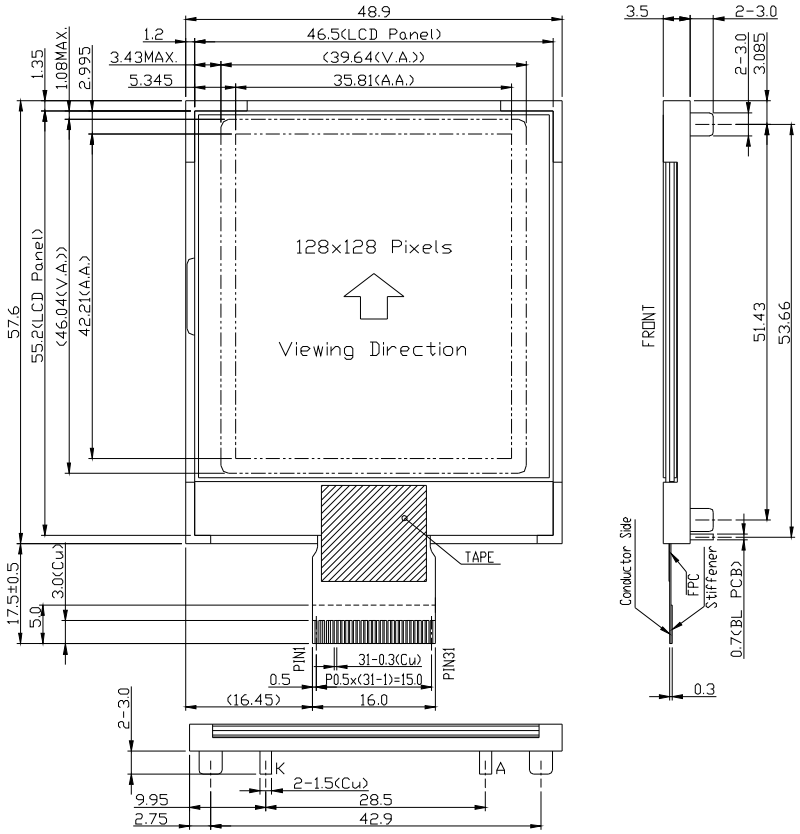
1. Basic Specifications

1.1 Display Specifications

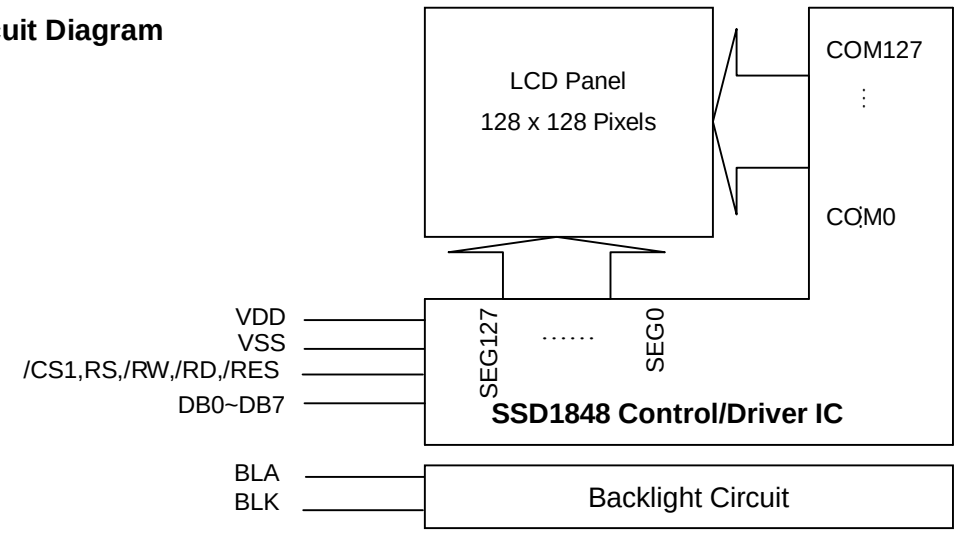
1>LCD Display Mode : FSTN, Positive, Transflective
2>Viewing Angle : 6H
3>Driving Method : 1/128 Duty, 1/12 Bias
4>Backlight : Blue

1.2 Mechanical Specifications

1>Outline Dimension : 48.9 x57.6x3.5mm (See attached Outline Drawing for Details)



1.3 Circuit Diagram



1.4 Interface Description

Pin No.	Pin Name	Function
1	PS0	Interface Control. (H:Parallel; L: Serial)
2	PS1	Interface Mode Control.(H:8080 or 3wire; L:6800 or 4wire)
3	/CSB	Chip selection input
4	/REST	Reset Signal
5	RS	Data/Command control.
6	/WR	Write (W/R) control signal input.
7	/RD	Read (/RD) control signal input.
8~15	DB0~DB7	8-bit Date bus
16	VDD	Power supply voltage (3.3v)
17	VSS	Negative power supply(0V)
18	VOUT	Voltage converter input / output pin
19	CAP4+	Capacitor 4 positive connection pin for voltage converter
20	CAP4-	Capacitor 4 negative connection pin for voltage converter
21	CAP3+	Capacitor 3 positive connection pin for voltage converter
22	CAP3-	Capacitor 3 negative connection pin for voltage converter
23	CAP2+	Capacitor 2 positive connection pin for voltage converter
24	CAP2-	Capacitor 2 negative connection pin for voltage converter
25	NC	
26	C1+	Capacitor 1 positive connection pin for voltage converter
27	C1-	Capacitor 1 negative connection pin for voltage converter
28	NC	
29	NC	
30	NC	
31	NC	

2. Absolute Maximum Ratings

Items	Symbol	MIN.	MAX.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+3.3	V	
	VLCD	-0.3	+15.0	V	
Input Voltage	V_{IN}	-0.3	V_{DD}+0.3	V	
Operating Temperature	T_{OP}	-0	+50	℃	
Storage Temperature	Tst	-10	+60	℃	

3. Electrical Characteristics

3.1 DC Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V_{DD}	System power supply pins of the logic block Range	Recommend Operating Voltage Possible Operating Voltage	2.4	2.7	3.3	V
V_{DDIO}	System power supply pins of logic block Range	Recommend Operating Voltage Possible Operating Voltage	1.7	-	V_{DD}	V
V_{CI}	Booster Reference Supply Voltage Range	Recommend Operating Voltage Possible Operating Voltage	V_{DD}	-	3.3	V
I_{AC}	Access Mode Supply Current Drain (V_{ci} Pins)	V_{CI} = 2.775V, Voltage Generator On, 6X DC-DC, Write accessing, Tcyc =5MHz, Frame Freq.= 35Hz, Display On, no panel attached.	-	450	550	µA
I_{DP}	Display Mode Supply Current Drain (V_{ci} Pins)	V_{CI} = 2.775V, V_{OUT} = 12V, Voltage Generator On, 6X DC-DC Converter Enabled, R/W(WR) Halt, Frame Freq.=35Hz, Display On, no panel attached.	150	260	450	µA
I_{SLEEP}	Sleep Mode Supply Current Drain (V_{DDIO}, V_{DD} and V_{CI} Pins)	V_{CI} = 2.775V, LCD Driving Waveform Off, Oscillator Off, R/W(WR) halt. (25°C)	-	0.5	2	µA
$I_{StandBy}$	Stand By Mode Supply Current Drain (V_{DDIO}, V_{DD} and V_{CI} Pins)	V_{CI} = 2.775V, Oscillator On, LCD Driving Waveform Off	20	38	70	µA
V_{OUT}	LCD Driving Voltage Generator Output (V_{out} Pin)	Display On, Voltage Generator Enabled, DC-DC Converter Enabled, Typ. Osc. Freq., Regulator Enabled, Divider Enabled.	-	-	15	V
	V_{OUT} Converter Efficiency	4X boost, no panel loading	-	99	99	%
		5X boost, no panel loading	-	96	99	
		6X boost, no panel loading	-	95	99	
		7X boost, no panel loading	-	92	98	
V_{OH1}	Logic High Output Voltage	Iout=-100uA	0.9*V_{DDIO}	-	V_{DDIO}	V
V_{OL1}	Logic Low Output Voltage	Iout=100uA	0.0	-	0.1*V_{DDIO}	V
V_{IH1}	Logic High Input voltage		0.8*V_{DDIO}	-	V_{DDIO}	V
V_{IL1}	Logic Low Input voltage		0.0	-	0.2*V_{DDIO}	V
I_{OH}	Logic High Output Current Source	Vout = V_{DD}-0.4V	50	-	-	µA
I_{OL}	Logic Low Output Current Drain	Vout = 0.4V	-	-	-50	µA
I_{OZ}	Logic Output Tri-state Current Drain Source		-1	-	1	µA
I_{IL}/I_{IH}	Logic Input Current		-1	-	1	µA
C_{IN}	Logic Pins Input Capacitance		-	5	7.5	pF
ΔV_{OUT}	Variation of V_{OUT} Output (V_{DD} is fixed)	Regulator Enabled, Internal Contrast Control Enabled, Set Contrast Control Register = 0	-	+/-2	-	%
TC0	Temperature Coefficient 0 (POR)	Voltage Regulator Enabled	-0.03	-0.01	0.00	%/°C
TC1	Temperature Coefficient 1		-0.07	-0.06	-0.05	%/°C

3.2 LED Backlight Circuit

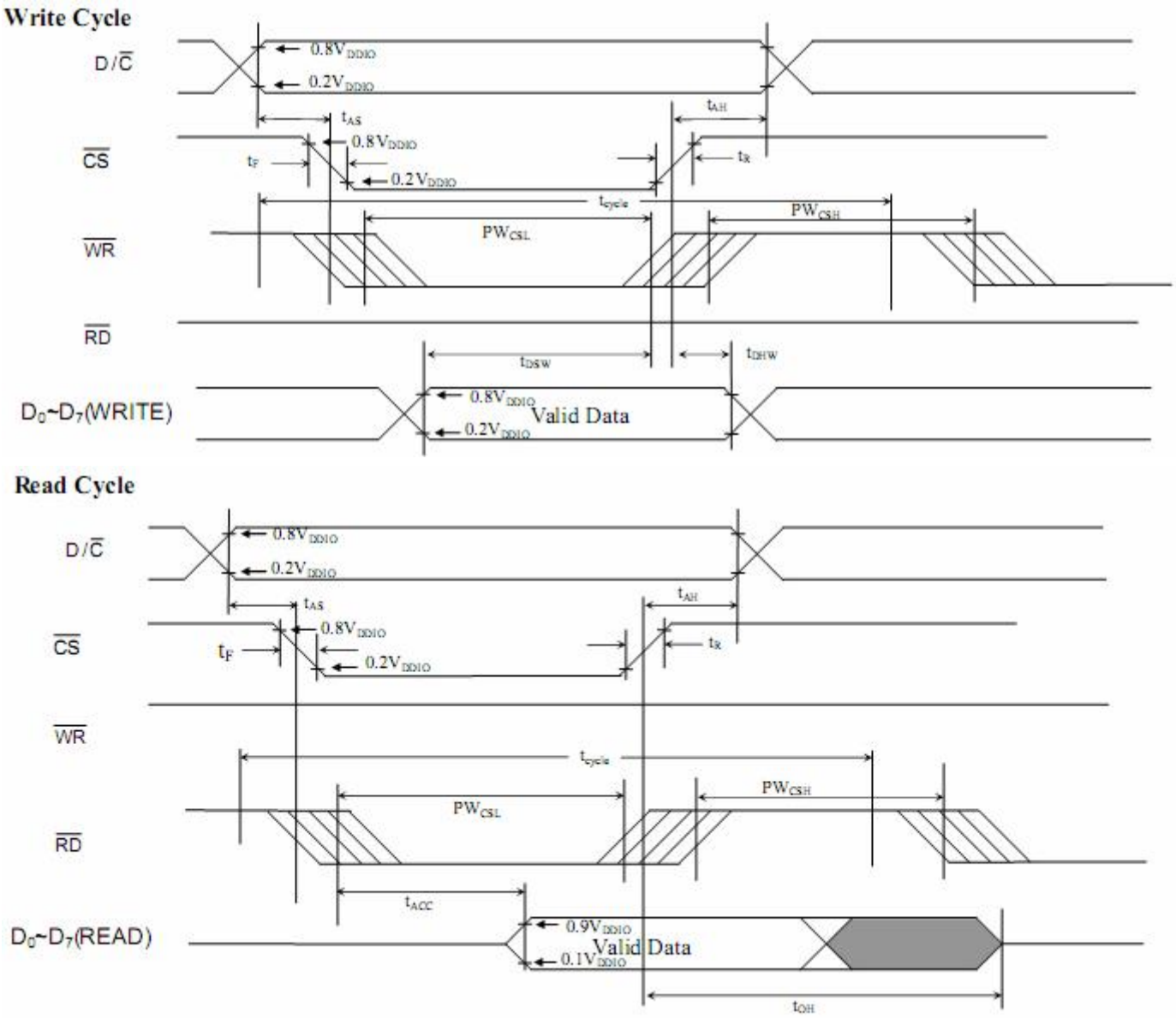
Vss = 0V,Top = 25℃

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Forword Voltage	Vf BLA	-	2.0	3.3	V	2.0V
Forword Current	If BLA	15	20	30	mA	2.0V

3.3 AC Characteristic

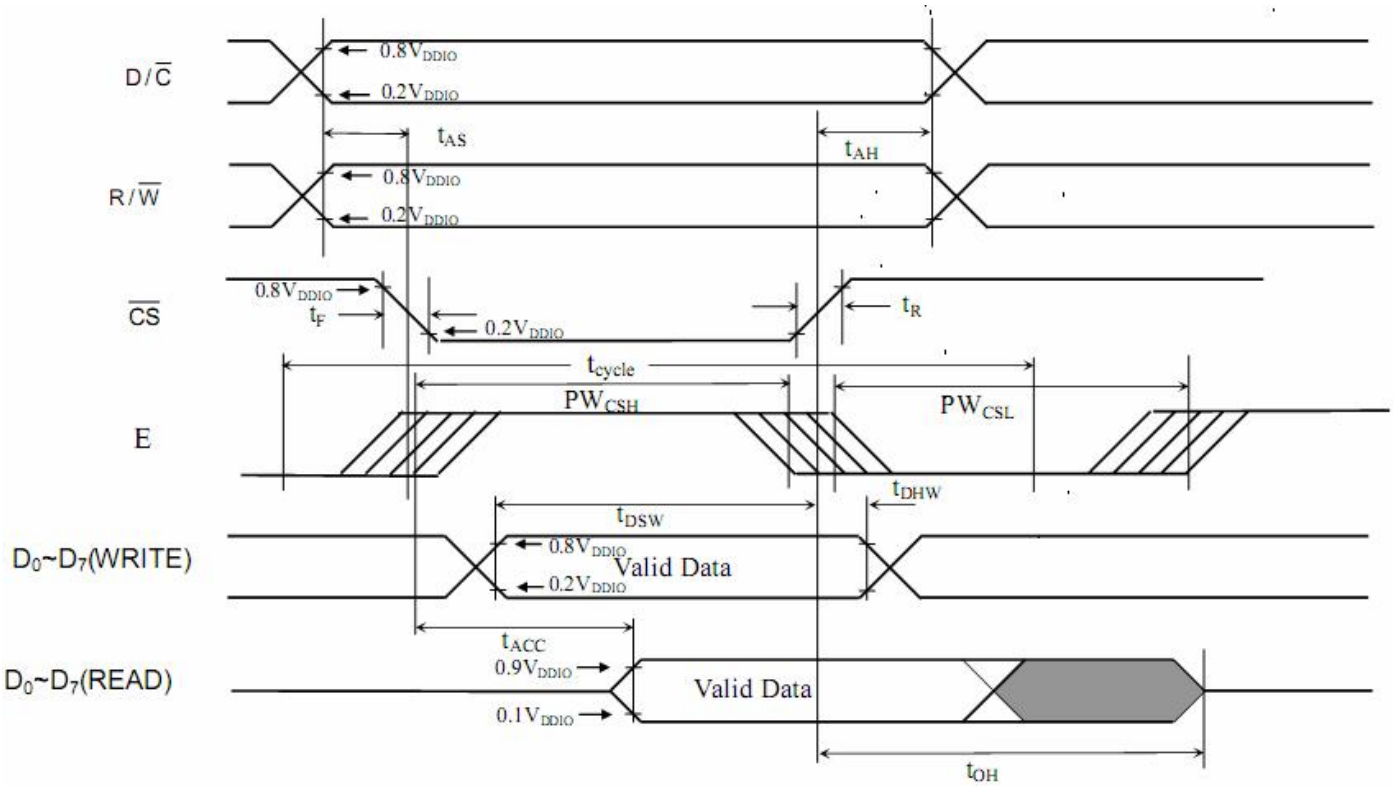
Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
F_{FRM}	Frame Frequency for: 130 x 130 MUX Mode	V_{CI}=2.775V, Display ON, Internal Oscillator Enabled	-	56.4	90	Hz

3.3.1 8080 Mode System Bus Time (PS0 = H, PS1 = L)



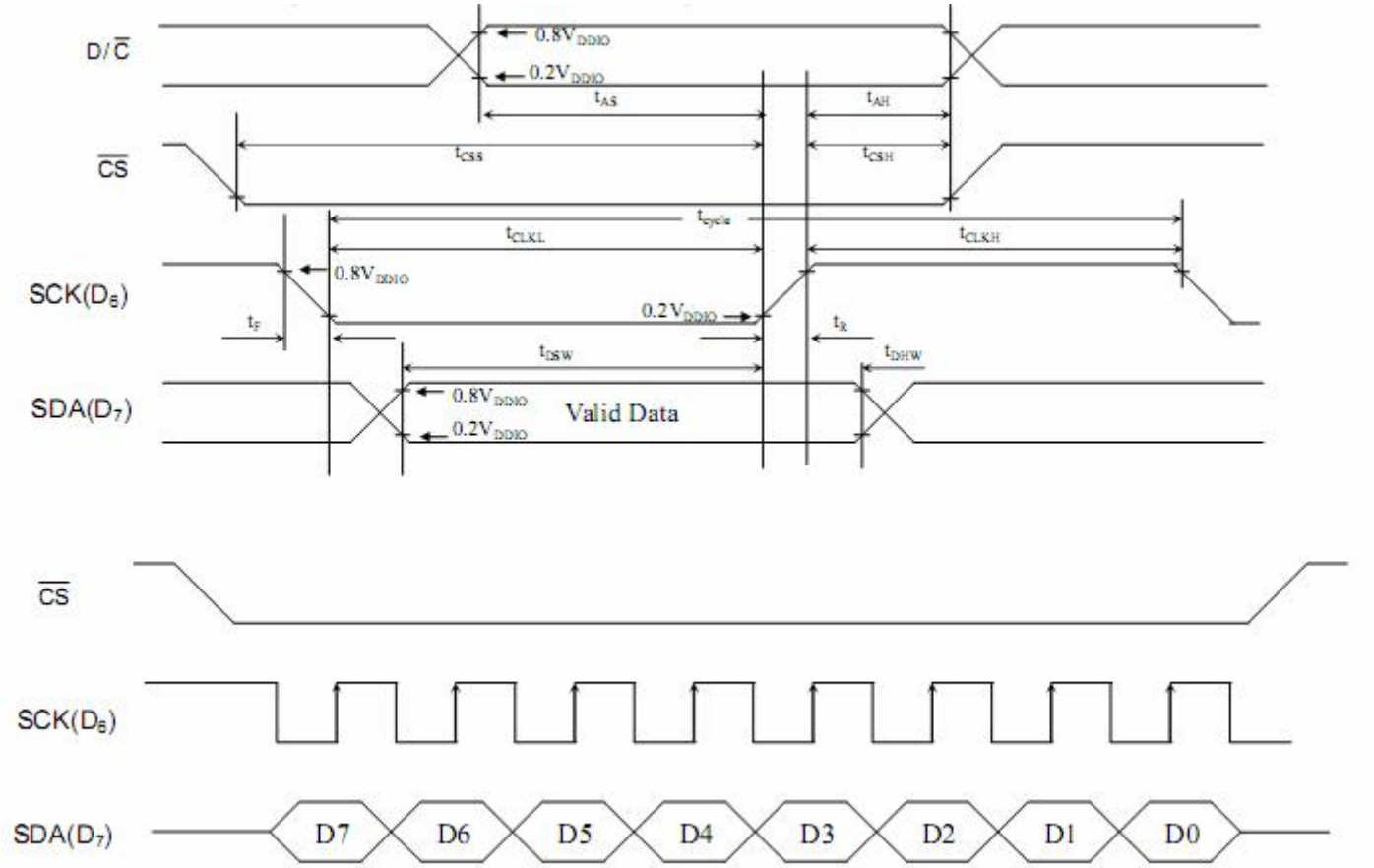
Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	-	100	-	ns
PW_{CSL}	Control Pulse Low Width	-	50	-	ns
PW_{CSH}	Control Pulse High Width	-	50	-	ns
t_F	Fall Time	-	-	10	ns
t_R	Rise Time	-	-	10	ns
t_{AS}	Address Setup Time	-	10	-	ns
t_{AH}	Address Hold Time	-	10	-	ns
t_{DSW}	Data Setup Time	-	60	-	ns
t_{DHW}	Data Hold Time	-	25	-	ns
t_{ACC}	Data Access Time	-	275	-	ns
t_{OH}	Output Hold time	-	125	-	ns

3.3.2 6800 Mode System Bus Time (PS0 = H, PS1 = H)



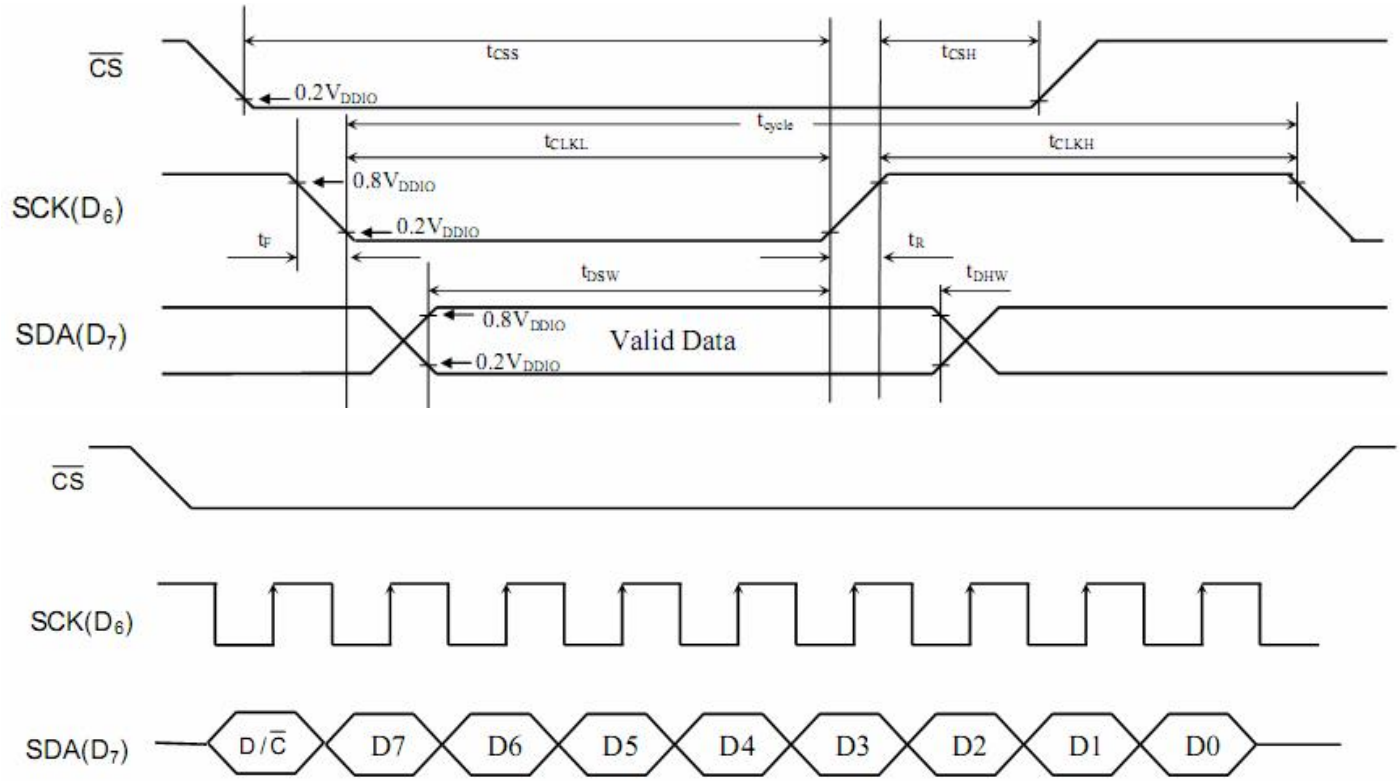
Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	-	100	-	ns
PW_{CSL}	Control Pulse Low Width	-	50	-	ns
PW_{CSH}	Control Pulse High Width	-	50	-	ns
t_F	Fall Time	-	-	10	ns
t_R	Rise Time	-	-	10	ns
t_{AS}	Address Setup Time	-	10	-	ns
t_{AH}	Address Hold Time	-	10	-	ns
t_{DSW}	Data Setup Time	-	60	-	ns
t_{DHW}	Data Hold Time	-	25	-	ns
t_{ACC}	Data Access Time	-	275	-	ns
t_{OH}	Output Hold time	-	125	-	ns

3.3.3 Seiral Interface-4 Wire (PS0 = L, PS1 = H)



Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	-	100	-	ns
f_{CLK}	Serial Clock Cycle Time SPI Clock tolerance = +/- 2 ppm	-	10	-	MHz
t_{AS}	Register select Setup Time	20	-	-	ns
t_{AH}	Register select Hold Time	30	-	-	ns
t_{CSS}	Chip Select Setup Time	-	35	-	ns
t_{CSH}	Chip Select Hold Time	-	50	-	ns
t_{DSW}	Write Data Setup Time	10	-	-	ns
t_{DHW}	Write Data Hold Time	10	-	-	ns
t_F	Fall Time	-	-	10	ns
t_R	Rise Time	-	-	10	ns
t_{CLKL}	Clock Low Time	-	50	-	ns
t_{CLKH}	Clock High Time	-	50	-	ns

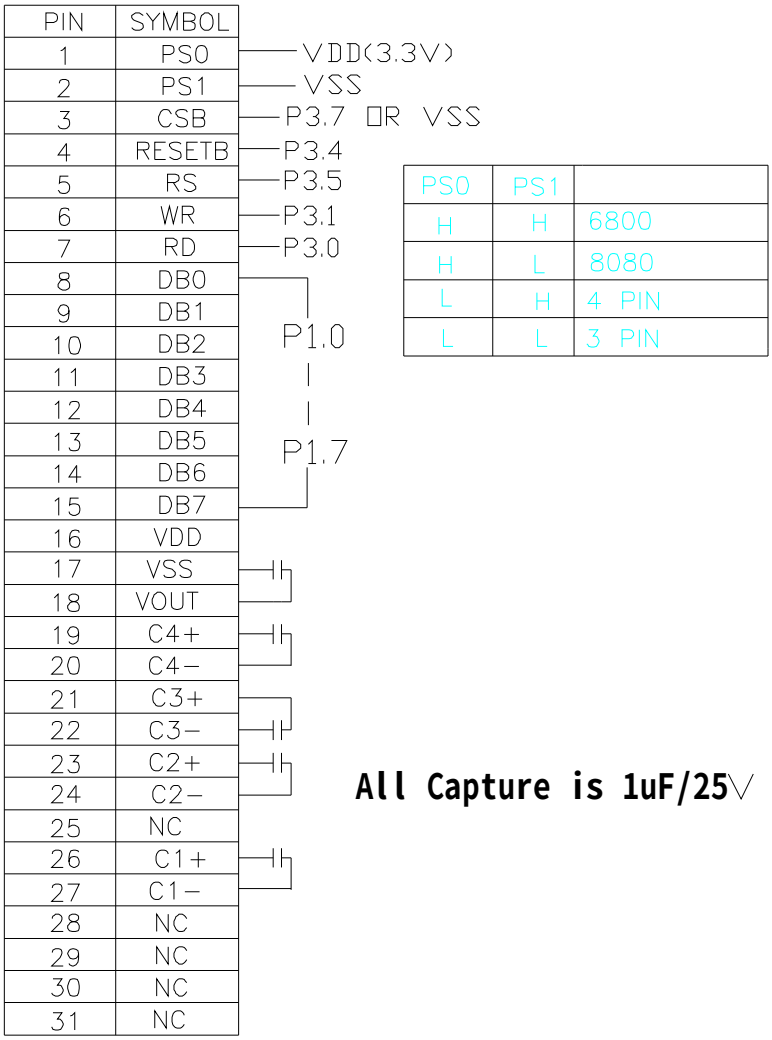
3.3.4 Seiral Interface-3 Wire (PS0 = L, PS1 = L)



Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	-	100	-	ns
f_{CLK}	Serial Clock Cycle Time SPI Clock tolerance = +/- 2 ppm	-	10	-	MHz
t_{CSS}	Chip Select Setup Time	-	35	-	ns
t_{CSH}	Chip Select Hold Time	-	50	-	ns
t_{DSW}	Write Data Setup Time	-	35	-	ns
t_{OHW}	Write Data Hold Time	-	50	-	ns
t_F	Fall Time	-	-	10	ns
t_R	Rise Time	-	-	10	ns
t_{CLKL}	Clock Low Time	-	50	-	ns
t_{CLKH}	Clock High Time	-	50	-	ns

4. Function specifications

4.1 The Parallel Interface



4.2 Basic Operating Sequence

Initialization Sequence

```
void intial(void)
{
     Comwrite(0xd1);    //Internal oscillator ON
    Comwrite(0x94);    //exit the sleep mode
     delay(10);

    Comwrite(0xf2);
    Datwrite(0x00);
    Datwrite(0x00);
    Comwrite(0xf7);
    Datwrite(0x00);
    Datwrite(0x0e);
    Datwrite(0x01);
    Comwrite(0xBC);
    Datwrite(0x00);
    Datwrite(0x00);
    Datwrite(0x00);
/*- - - - P13    P12    P11    P10*/
/*P10 为上下镜像*/
/*P10 = 0: set page address to normal display*/
/*P10 = 1: set page address to inverse display*/

/*P11 为左右镜像*/
/*P11 = 0:
set column address to normal rotation */
/*P11 = 1:
set column address to inverse rotation */

    Comwrite(0x15);    //Set Column    0~32
    Datwrite(1);    //start column address
    Datwrite(32);    //end column address

    Comwrite(0x75);    //Set Page 0~129
    Datwrite(0x00);    //start page address
    Datwrite(0x7f);    //end page address

    Comwrite(0x44);    //Set 1st Com Line
    Datwrite(0x00);

    Comwrite(0xBB);
    Datwrite(0x01);
    Comwrite(0xCA); //Driver duty selection
    Datwrite(0x00);
    Datwrite(0x20);
    Datwrite(0x00);

   Comwrite(0x20);//Set Power Control Registr
    Datwrite(0x0f);
   delay(150);

    Comwrite(0x81);
//Set Contrast Level & Internal Regulator Resistor Ratio
    Datwrite(0x3C);    //X5--X0
    Datwrite(0x07);    //Y2--Y0

    Comwrite(0x82);
    Datwrite(0x01);

    Comwrite(0xFB);    //set bias
    Datwrite(0x01);    //1/12 bias

    Comwrite(0xF3);    //Bias current,
    Datwrite(0xc4);
    Datwrite(0x15);
    Datwrite(0x00);
    Datwrite(0x80);

    Comwrite(0xF2);    //SET Frame frequency
    Datwrite(0x40);
    Datwrite(0x04);
    Datwrite(0x10);
    Datwrite(0x01);
    Comwrite(0xAF); //display on
}
```

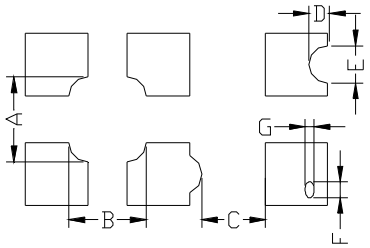
```
void Comwrite(Uchar com)
{
    CS1=0;
    R_S=0;
    W_R=0;
    R_D=1;
    P1=com;
    W_R=1;
    CS1=1;
}

void Datwrite(Uchar dat)
{
    CS1=0;
    R_S=1;
    W_R=0;
    R_D=1;
    P1=dat;
    W_R=1;
    CS1=1;
}

void Setadd(Uchar xs,ys,Uchar xd,yd)
{
    xs+=0;
    xd+=0;
     //ys*=14;
     //yd=ys+14;
    Comwrite(0x15);    //Set Column    0~32
    Datwrite(xs);      //start column address
    Datwrite(xd);      //end column address
    Comwrite(0x75);    //Set Page 0~129
    Datwrite(ys);      //start page address
    Datwrite(yd);      //end page address
    Comwrite(0x5c);
}
```

注：详细显示据程序请参考<洪泰>提供的参考程序 HTG128128Z-SSD1848-P80 ！
指令说明请查看 SSD1848 IC PDF 资料相关内容！
如需咨询，请至电：0755-33671719 陈工

5. Inspection Standards

Item	Criterion for defects	Defect type
1) Display on inspection	(1) Non display (2) Vertical line is deficient (3) Horizontal line is deficient (4) Cross line is deficient	Major
2) Black / White spot	Size Φ(mm) Acceptable number Φ≤0.3 Ignore (note) 0.3<Φ≤0.45 3 0.45<Φ≤0.6 1 0.6<Φ 0	Minor
3) Black / White line	Length (mm) Width (mm) Acceptable number L≤10 W≤0.03 Ignore 5.0≤L≤10 0.03<W≤0.04 3 5.0≤L≤10 0.04<W≤0.05 2 1.0≤L≤10 0.05<W≤0.06 2 1.0≤L≤10 0.06<W≤0.08 1 L≤10 0.08<W follows 2) point defect Defects separate with each other at an interval of more than 20mm	Minor
4) Display pattern	 $\frac{A+B}{2}\leq 0.28$ 0<C $\frac{D+E}{2}\leq 0.25$ $\frac{F+G}{2}\leq 0.25$ Note: 1) Up to 3 damages acceptable 2) Not allowed if there are two or more pinholes every three-fourth inch.	Minor
5) Spot-like contrast irregularity	Size Φ(mm) Acceptable Number Φ≤0.7 Ignore (note) 0.7<Φ≤1.0 3 1.0<Φ≤1.5 1 1.5<Φ 0 Note: 1) Conformed to limit samples. 2) Intervals of defects are more than 30mm.	Minor
6) Bubbles in polarizer	Size Φ(mm) Acceptable Number Φ≤0.4 Ignore (note) 0.4<Φ≤0.65 2 0.65<Φ≤1.2 1 1.2<Φ 0	Minor
7) Scratches and dent on the polarizer	Scratches and dent on the polarizer shall be in the accordance with "2) Black/white spot", and "3) Black/White line".	Minor
8) Stains on the surface of LCD panel	Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning.	Minor
9) Rainbow color	No rainbow color is allowed in the optimum contrast on state within the active area.	Minor
10) Viewing area encroachment	Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.	Minor
11) Bezel appearance	Rust and deep damages that are visible in the bezel are rejected.	Minor
12) Defect of land surface contact	Evident crevices that are visible are rejected.	Minor
13) Parts mounting	(1) Failure to mount parts (2) Parts not in the specifications are mounted (3) For example: Polarity is reversed, HSC or TCP falls off.	Minor
14) Part alignment	(1) LSI, IC lead width is more than 50% beyond pad outline. (2) More than 50% of LSI, IC leads is off the pad outline.	Minor
15) Conductive foreign matter (solder ball, solder hips)	(1) 0.45<Φ, N≥1 (2) 0.3<Φ≤0.45, N≥1, Φ: Average diameter of solder ball (unit: mm) (3) 0.5<L, N≥1, L: Average length of solder chip (unit: mm)	Minor
16) Bezel flaw	Bezel claw missing or not bent	Minor
17) Indication on name plate (sampling indication label)	(1) Failure to stamp or label error, or not legible.(all acceptable if legible) (2) The separation is more than 1/3 for indication discoloration, in which the characters can be checked.	Minor

6. Handling Precautions

6.1 Mounting method

A panel of LCD module made by our company consists of two thin glass plates with polarizers that easily get damaged.
And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board (PCB), extreme care should be used when handling the LCD modules.

6.2 Cautions of LCD handling and cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.
-Isopropyl alcohol
-Ethyl alcohol
-Trichlorotriflorothane
Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.
Do not use the following solvent:
-Water
-Ketene
-Aromatics

6.3 Caution against static charge

The LCD module use C-MOS LSI drivers. So we recommend you:
Connect any unused input terminal to V_{dd} or V_{ss}. Do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

6.4 Packaging

-Module employs LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
-To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

6.5 Caution for operation

-It is an indispensable condition to drive LCD module within the limits of the specified voltage since the higher voltage over the limits may cause the shorter life of LCD module.
-An electrochemical reaction due to DC (direct current) causes LCD undesirable deterioration so that the uses of DC (direct current) drive should be avoided.
-Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD module may show dark color in them. However those phenomena do not mean malfunction or out of order of LCD module, which will come back in the specified operating temperature.

6.6 Storage

In the case of storing for a long period of time, the following ways are recommended:
-Storage in polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with not desiccant.
-Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping the storage temperature range.
-Storing with no touch on polarizer surface by any thing else.

6.7 Safety

-It is recommendable to crash damaged or unnecessary LCD into pieces and to wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
-When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well at once with soap and water.