

# Product Specification

Supplier:GoldenMorning Electronic

Model Number: GME12864-41

深圳市金逸晨电子有限公司

PREPARED BY	CHECKED BY	APPROVED BY

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## ■ PHYSICAL DATA (物理参数)

NO.编号	Items 项目	Specification 规格	Unit 单位
1	Diagonal Size 尺寸	0.96	Inch
2	Resolution 分辨率	128x 64	Dots
3	Active Area 有效显示区域	21.740(W) x 11.175(H)	mm <sup>2</sup>
4	Outline Dimension 外围尺寸	24.70(W) x 16.60(H)	mm <sup>2</sup>
5	Pixel Pitch 像素间距	0.170(W) x 0.175(H)	mm <sup>2</sup>
6	Pixel Size 像素尺寸	0.150(W) x 0.150(H)	mm <sup>2</sup>
7	Driver IC 驱动 IC	SSD1315Z	-
8	Display Color 显示色彩	White	-
9	Gray Scale 灰阶	1	Bit
10	Interface 接口	4-SPI/I2C/8080	-
11	IC Package Type IC 封装类型	COG	-
12	Module Connecting Type 模块连接方式	SOLDER	-
13	Thickness 厚度	1.30 ±0.1	mm
14	Weight 重量	TBD±10%	g
15	Duty 占空比	1/64	-

**■ ABSOLUTE MAXIMUM RATINGS (极限参数)**

Unless otherwise specified, VSS = 0V

(Ta=25℃)

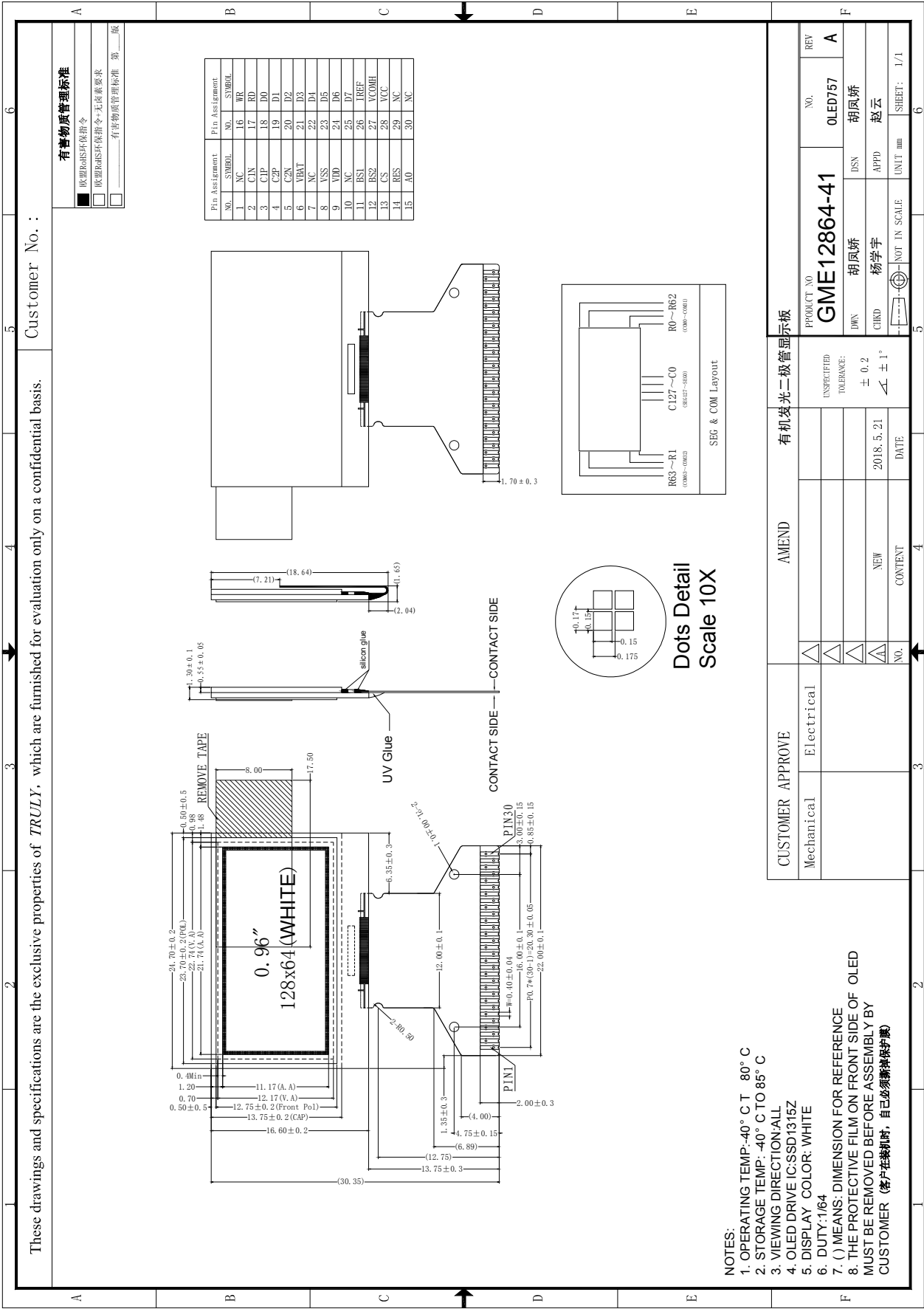
除另行规定外, VSS=0V

Items 项目	Min. 最小值	Max. 最大值	Unit 单位	Remark 备注
Supply Voltage(VDD) 逻辑电压 (VDD)	-0.3	+4.0	V	IC maximum rating IC 极限参数
Supply Voltage(VBAT) 内部电压 (VBAT)	-0.3	+6.0	V	IC maximum rating IC 极限参数
Supply Voltage(VCC) 驱动电压 (VCC)	0	+18.0	V	IC maximum rating IC 极限参数
Operating Temperature(T <sub>OP</sub> ) 操作温度 (T <sub>OP</sub> )	-40	80	℃	-
Storage Temperature(T <sub>ST</sub> ) 存储温度 (T <sub>SP</sub> )	-40	85	℃	Note 2

**NOTE:**

1. Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect reliability.  
如果超过极限参数可能会导致器件永久性损坏。实际工作条件应仅限于在本数据表格中详述的操作部分。在极限参数条件下长时间工作会影响其可靠性。
2. The defined temperature ranges do not include the polarizer. The maximum withstood temperature of the polarizer should be 80℃.  
定义的温度范围不包括偏光片。偏光片的最大值耐温应为 80℃。
3. Humidity: Temperature should be 29℃ max. and no condensation of water.  
湿度:最高温度应不超过 29℃, 且不可凝结水珠。

EXTERNAL DIMENSIONS (外形尺寸)



## ■ ELECTRICAL CHARACTERISTICS (电气特性)

### ◆ DC Characteristics (直流特性)

Unless otherwise specified, Voltage referenced to VSS;

除另行规定外，参考电平为 VSS;

VDD=3.0V, VCC = 7.5.0V, IREF = 10uA,

(Ta = 22±3℃, 60±10%RH)

Items 项目		Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位
Supply Voltage 供电电压	Logic Supply Voltage IC 逻辑电压	V <sub>DD</sub>	1.65	3.0	3.5	V
	Charge Pump Regulator Supply Voltage IC 内部升压电压	V <sub>BAT</sub>	3.0	3.3	4.5	V
	Operating (for OLED panel) 操作电压 (供 OLED 面板)	V <sub>CC</sub>	7.0	7.5	8.0	V
Input Voltage 输入电压	High Voltage 高电平	V <sub>IH</sub>	0.8 x V <sub>DD</sub>	-	V <sub>DD</sub>	V
	Low Voltage 低电平	V <sub>IL</sub>	0	-	0.2 x V <sub>DD</sub>	V
Output Voltage 输出电压	High Voltage 高电平	V <sub>OH</sub>	0.9 x V <sub>DD</sub>	-	V <sub>DD</sub>	V
	Low Voltage 低电平	V <sub>OL</sub>	V <sub>SS</sub>	-	0.1 x V <sub>DD</sub>	V

## ◆ AC Characteristics (交流特性)

## Conditions:

Voltage referenced to  $V_{SS}$  参考电压为  $V_{SS}$  $V_{DD}=1.65$  to  $3.5V$  $T_A = 25^{\circ}C$ 

## AC Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
$F_{OSC}^{(1)}$	Oscillation Frequency of Display Timing Generator 显示时钟发生器的震荡频率	$V_{DD} = 2.8V$	620	688	756	kHz
$F_{FRM}$	Frame Frequency 帧频	128x64 Graphic Display Mode, Display ON, Internal Oscillator Enabled 128x64 图像显示模式, 显示开, 使能内部振荡器	-	$F_{OSC} \times 1/(D \times K \times 64)^{(2)}$	-	Hz
RES#	Reset low pulse width 复位脉冲持续时间		3	-	-	us

## Note:

(1)  $F_{OSC}$  stands for the frequency value of the internal oscillator and the value is measured when command D5h A[7:4] is in default value.

$F_{OSC}$  表示内部振荡器的频率值, 该值在 D5h 设定为缺省值时测得。

(2) D: divide ratio (default value = 1)

D: 分频比 (默认值=1)

K: number of display clocks per row period (default value = 103)

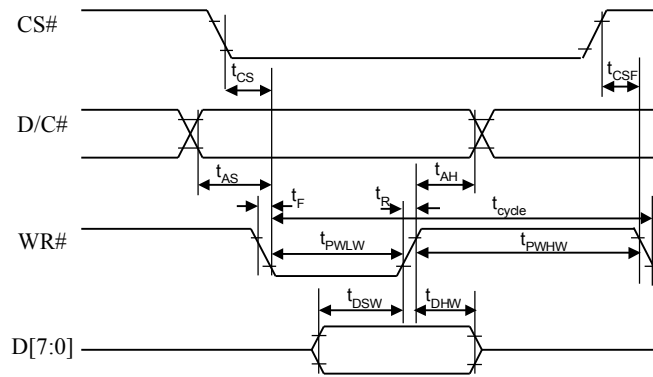
K: 每行显示周期的时钟数 (默认值=103)

Please refer to (Set Display Clock Divide Ratio/Oscillator Frequency, D5h) for detail description  
详细的描述请参考 (设置时钟分频比/震荡频率, D5h)

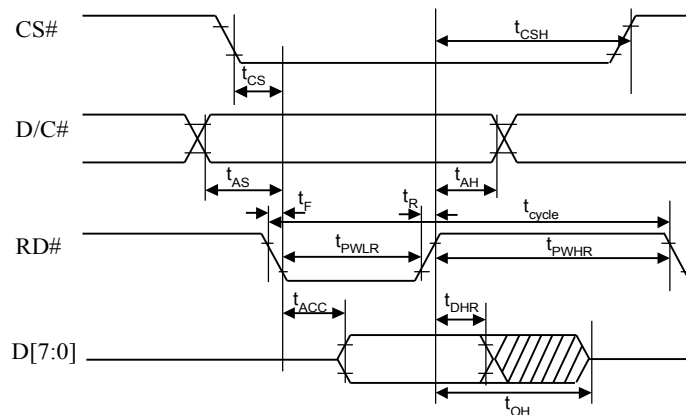
## 1. 8080 Interface Timing Characteristics 8080 接口时序特性

(V<sub>DD</sub> - V<sub>SS</sub> = 1.65V ~ 3.5V, T<sub>A</sub> = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t <sub>cycle</sub>	Clock Cycle Time	300	-	-	ns
t <sub>AS</sub>	Address Setup Time	10	-	-	ns
t <sub>AH</sub>	Address Hold Time	0	-	-	ns
t <sub>DSW</sub>	Write Data Setup Time	40	-	-	ns
t <sub>DHW</sub>	Write Data Hold Time	20	-	-	ns
t <sub>DHR</sub>	Read Data Hold Time	20	-	-	ns
t <sub>OH</sub>	Output Disable Time	-	-	70	ns
t <sub>ACC</sub>	Access Time	-	-	180	ns
t <sub>PWLR</sub>	Read Low Time	180	-	-	ns
t <sub>PWLW</sub>	Write Low Time	60	-	-	ns
t <sub>PWHR</sub>	Read High Time	60	-	-	ns
t <sub>PWHW</sub>	Write High Time	60	-	-	ns
t <sub>R</sub>	Rise Time	-	-	40	ns
t <sub>F</sub>	Fall Time	-	-	40	ns
t <sub>CS</sub>	Chip select setup time	0	-	-	ns
t <sub>CSH</sub>	Chip select hold time to read signal	0	-	-	ns
t <sub>CSF</sub>	Chip select hold time	20	-	-	ns



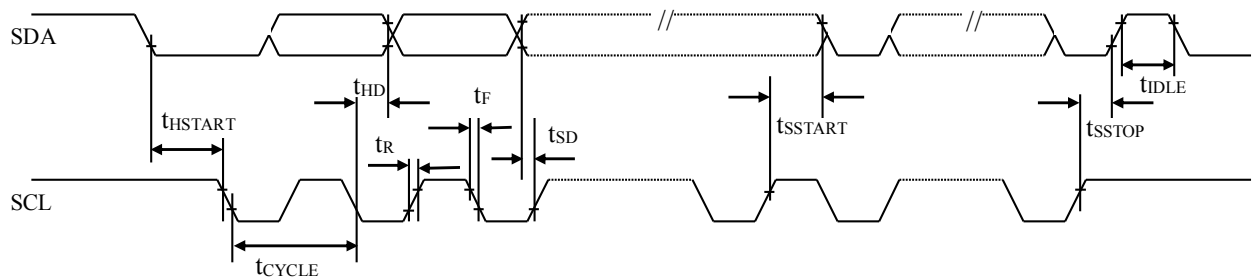
Write Cycle



Read Cycle

## 2. IIC Interface Timing Characteristics IIC 接口时序特性

Symbol	Parameter	Min	Typ	Max	Unit
$t_{\text{cycle}}$	Clock Cycle Time	2.5	-	-	us
$t_{\text{HSTART}}$	Start condition Hold Time	0.6	-	-	us
$t_{\text{HD}}$	Data Hold Time (for “SDA <sub>OUT</sub> ” pin)	0	-	-	ns
	Data Hold Time (for “SDA <sub>IN</sub> ” pin)	300	-	-	ns
$t_{\text{SD}}$	Data Setup Time	100	-	-	ns
$t_{\text{SSTART}}$	Start condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	-	us
$t_{\text{SSTOP}}$	Stop condition Setup Time	0.6	-	-	us
$t_{\text{R}}$	Rise Time for data and clock pin	-	-	300	ns
$t_{\text{F}}$	Fall Time for data and clock pin	-	-	300	ns
$t_{\text{IDLE}}$	Idle Time before a new transmission can start	1.3	-	-	us

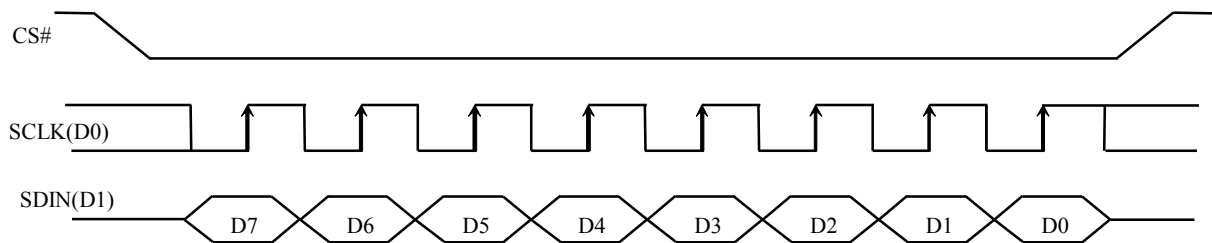
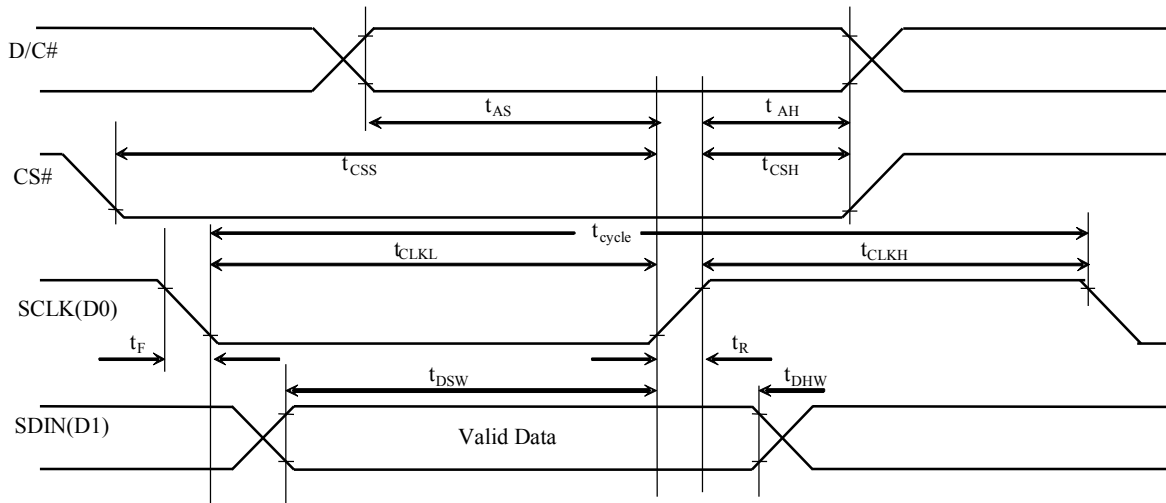




## 3. 4- SPI Interface Timing Characteristics 4- SPI 接口时序特性

(V<sub>DD</sub> - V<sub>SS</sub> = 1.65V~3.5V, T<sub>A</sub> = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t <sub>cycle</sub>	Clock Cycle Time	100	-	-	ns
t <sub>AS</sub>	Address Setup Time	15	-	-	ns
t <sub>AH</sub>	Address Hold Time	15	-	-	ns
t <sub>CSS</sub>	Chip Select Setup Time	20	-	-	ns
t <sub>CSH</sub>	Chip Select Hold Time	20	-	-	ns
t <sub>DSW</sub>	Write Data Setup Time	15	-	-	ns
t <sub>DHW</sub>	Write Data Hold Time	25	-	-	ns
t <sub>CLKL</sub>	Clock Low Time	30	-	-	ns
t <sub>CLKH</sub>	Clock High Time	30	-	-	ns
t <sub>R</sub>	Rise Time	-	-	40	ns
t <sub>F</sub>	Fall Time	-	-	40	ns



## ■ TIMING OF POWER SUPPLY（电源时序）

The following figures illustrate the recommended power ON and power OFF sequence of SSD1315Z.

以下图示表示 SSD1315Z 推荐的上电和下电时序。

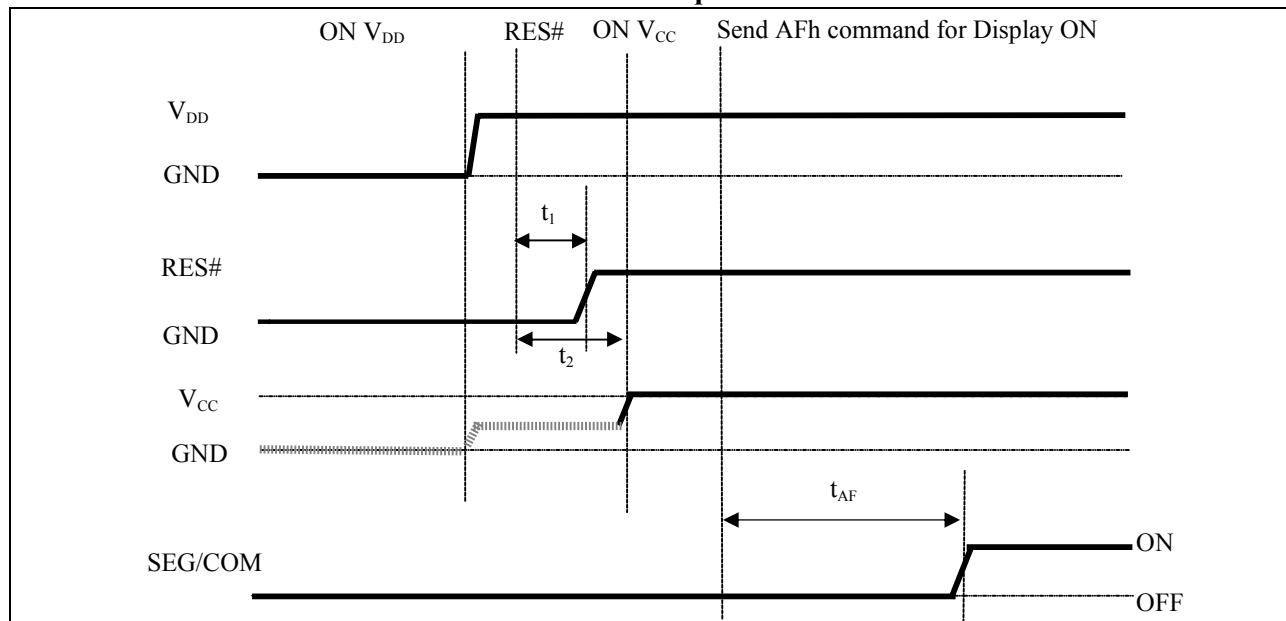
### ● Power ON and OFF sequence with External VCC.

#### Power ON sequence:

##### 上电时序

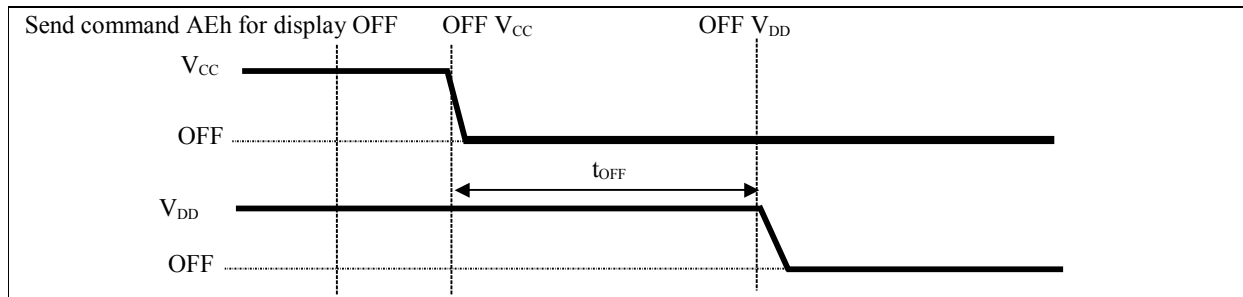
1. Power ON  $V_{DD}$   
打开  $V_{DD}$
2. After  $V_{DD}$  become stable, set RES# pin LOW (logic low) for at least  $3\mu s$  ( $t_1$ )<sup>(4)</sup> and then HIGH (logic high)  
在  $V_{DD}$  稳定后, RES#引脚置低（逻辑低）至少  $3\mu s(t_1)$ <sup>(4)</sup>再置高（逻辑高）
3. After RES# HIGH (logic high), wait for at least  $3\mu s$  ( $t_2$ ). Then power ON  $V_{CC}$ .<sup>(1)</sup>  
在 RES#置高（逻辑高）后, 至少等待  $3\mu s(t_2)$ 。然后打开  $V_{CC}$ 。
4. After  $V_{CC}$  become stable, send command AFh for display ON. SEG/COM will be ON after  $100ms(t_{AF})$ .  
在  $V_{CC}$  稳定后, 发送 AFh 命令打开显示, SEG/COM 会在  $100ms(t_{AF})$ 后打开。

#### Power ON Sequence



**Power OFF sequence:****下电时序**

5. Send command AEh for display OFF.  
发送 AEh 命令关闭显示。
6. Power OFF  $V_{CC}^{(2),(3)}$ .  
关闭  $V_{CC}$ 。<sup>(2)(3)</sup>
7. Power OFF  $V_{DD}$  after  $t_{OFF}^{(4)}$  (where Minimum  $t_{OFF}=0ms$ , typical  $t_{OFF}=100ms$ )  
在  $t_{OFF}^{(4)}$  后关闭  $V_{DD}$ 。<sup>(4)</sup> ( $t_{OFF}$  的最小值为 0ms, 典型值为 100ms)

**Power OFF Sequence****Note:**

- (1)  $V_{CC}$  should be kept float (i.e. disable) when it is OFF.  
在  $V_{CC}$  关闭时应保持悬空（即失能）。
- (2) Power Pins ( $V_{DD}$ ,  $V_{CC}$ ) can never be pulled to ground under any circumstance.  
电源引脚 ( $V_{DD}$ ,  $V_{CC}$ ) 在任何情况下都不能接地。
- (3) The register values are reset after  $t_1$ .  
寄存器的值在  $t_1$  后重置。
- (4)  $V_{DD}$  should not be Power OFF before  $V_{CC}$  Power OFF.  
 $V_{DD}$  不应该在  $V_{CC}$  电源关闭之前关闭。

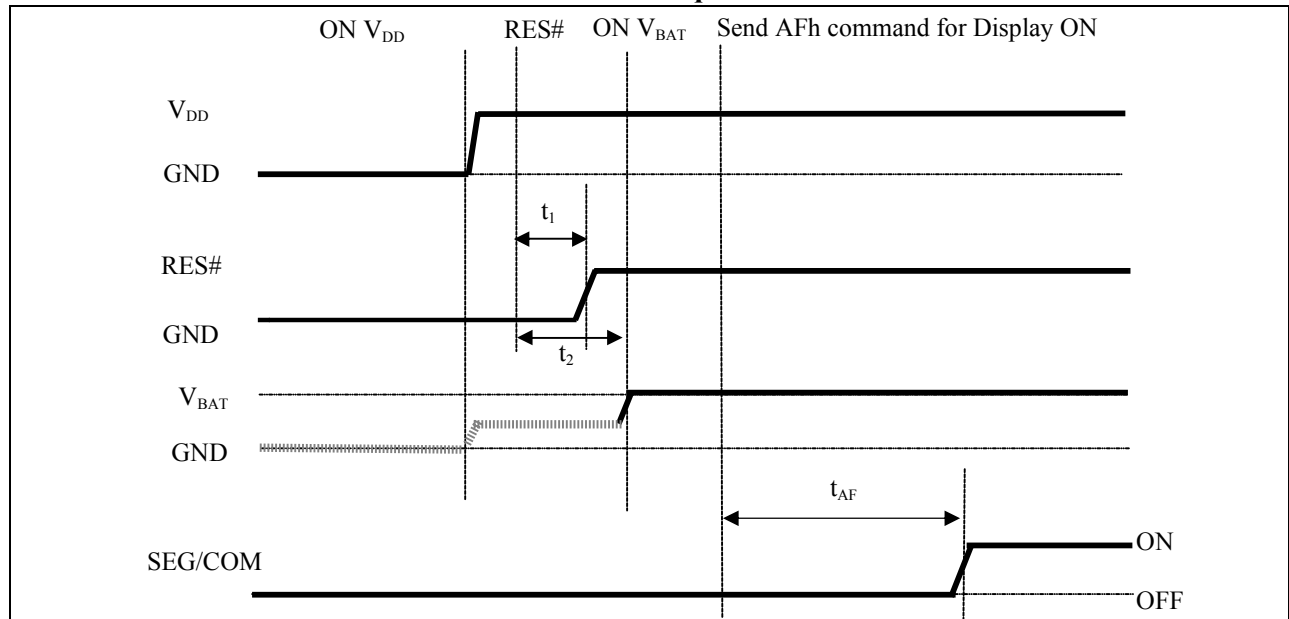
## ● Power ON and OFF sequence with Charge Pump.

### Power ON sequence:

#### 上电时序

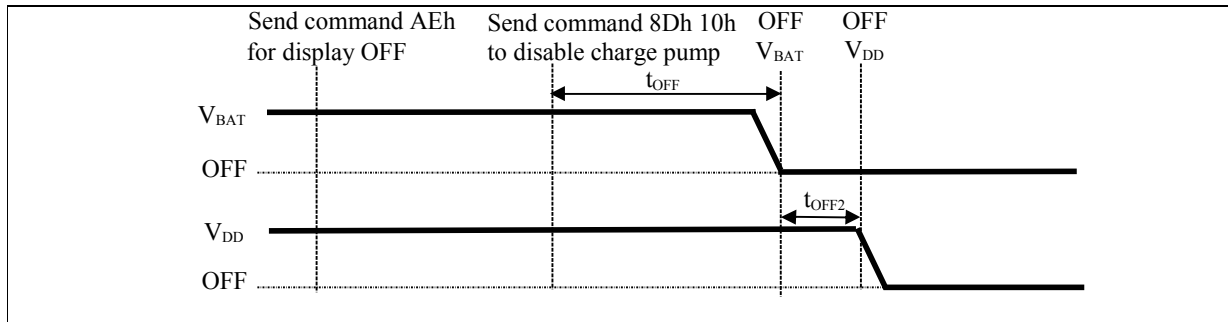
1. Power ON  $V_{DD}$   
打开  $V_{DD}$
2. Wait for  $t_{ON}$ . Power ON  $V_{BAT}^{(1), (2)}$ . (where Minimum  $t_{ON} = 0ms$ )  
等待  $t_{ON}$ , 打开  $V_{BAT}^{(1), (2)}$ .
3. After  $V_{BAT}$  become stable, set RES# pin LOW (logic low) for at least  $3us$  ( $t_1$ ) <sup>(3)</sup> and then HIGH (logic high)  
在  $V_{BAT}$  稳定后, RES#引脚置低 (逻辑低) 至少  $3us(t_1)^{(3)}$  再置高 (逻辑高)
4. After RES# HIGH (logic high), wait for at least  $3us$  ( $t_2$ ). Then input commands with below sequence:  
在 RES#置高 (逻辑高) 后, 至少等待  $3us(t_2)$ 。然后输入以下指令:  
a. 8Dh 14h for enabling charge pump.  
a. 8Dh 14h f 用于使能内部升压指令。.  
b. AFh for display ON.  
b. AFh 用于显示指令.
5. SEG/COM will be ON after  $100ms(t_{AF})$ .  
SEG/COM 在  $100ms(t_{AF})$ 后打开。

### Power ON Sequence



**Power OFF sequence:****下电时序**

1. Send command AEh for display OFF.  
发送 AEh 命令关闭显示。
2. Send command 8Dh 10h to disable charge pump  
发送指令 8Dh 10h 关掉内部升压。
3. Power OFF  $V_{BAT}$  after  $t_{OFF}^{(1), (2)}$  typical  $t_{OFF}=100ms$   
在  $t_{OFF}^{(1), (2)}$  后关闭  $V_{BAT}$ 。 (典型值为 100ms)
4. Power OFF  $V_{DD}$  after  $t_{OFF2}^{(4)}$  (where Minimum  $t_{OFF}=0ms$ , typical  $t_{OFF2}=100ms$ )  
在  $t_{OFF2}^{(4)}$  后关闭  $V_{DD}$ 。 ( $t_{OFF}$  的最小值为 0ms, 典型值为 100ms)

**Power OFF Sequence with Charge Pump****Note:**

- (1)  $V_{BAT}$  should be kept float (i.e. disable) when it is OFF.  
在  $V_{BAT}$  关闭时应保持悬空 (即失能)。
- (2) Power Pins ( $V_{DD}$ ,  $V_{BAT}$ ) can never be pulled to ground under any circumstance.  
电源引脚 ( $V_{DD}$ ,  $V_{BAT}$ ) 在任何情况下都不能接地。
- (3) The register values are reset after  $t_1$ .  
寄存器的值在  $t_1$  后重置。
- (4)  $V_{DD}$  should not be Power OFF before  $V_{BAT}$  Power OFF.  
 $V_{BAT}$  不应该在  $V_{CC}$  电源关闭之前关闭。

## ■ ELECTRO-OPTICAL CHARACTERISTICS (光电参数)

All data in below based the condition ( $T_a = 22 \pm 3^\circ\text{C}$ ,  $60 \pm 10\% \text{RH}$ ).

以下参数均基于  $T_a = 22 \pm 3^\circ\text{C}$ ,  $60 \pm 10\% \text{RH}$  的条件。

Items 项目		Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Remark 备注
Operating Luminance 工作亮度		L	50	65	-	cd /m <sup>2</sup>	All pixels ON
Power Consumption 功耗		P	-	50	60	mW	30% pixels ON
Frame Frequency 帧频		Fr	-	105	-	Hz	-
Color Coordinate 色坐标	Blue	CIE x	0.11	0.15	0.19	CIE1931	Darkroom
		CIE y	0.21	0.25	0.29		
Response Time 响应时间	Rise	Tr	-	10	-	us	-
	Decay	Td	-	10	-	us	-
Contrast Ratio* 对比度		Cr	10000:1	-	-	-	Darkroom
Viewing Angle 可视角		Δθ	160	-	-	Degree	-
Operating Life Time* 工作寿命		Top	22000	-	-	Hours	L= 65 cd/m <sup>2</sup>

### Note(注意事项) :

1. 65 cd/m<sup>2</sup> is based on  $V_{DD}=3.3\text{V}$ ,  $V_{BAT}=3.3\text{V}$ , Contrast command setting 0xCF;

C 65 cd/m<sup>2</sup> 基于  $V_{DD}=3.3\text{V}$ ,  $V_{BAT}=3.3\text{V}$ , 对比度设置为 0xCF;

2. **Contrast ratio** is defined as follows(对比度的定义如下):

$$\text{Contrast ratio} = \frac{\text{Photo - detector output with OLED being "white"}}{\text{Photo - detector output with OLED being "black"}}$$

OLED 显示全屏亮时的亮度  
OLED 显示全屏黑时的亮度

3. **Life Time** is defined when the Luminance has decayed to less than 50% of the initial Luminance specification. (Odd and even chess board alternately displayed).(The initial value should be closed to the typical value after adjusting.)

寿命的定义为当亮度衰减到初始亮度 50% 时所消耗的时间。(奇数和偶数棋盘交替显示)。(初始亮度值应调试到接近典型值的大小)。

## ■ INTERFACE PIN CONNECTIONS (引脚接口)

No	Symbol	Description
1	NC	No connection.不连接
2	C1N	CXP/CXN-Pin for charge pump capacitor;Connect to each other with a capacitor。内部升压需接升压电容
3	C1P	
4	C2P	
5	C2N	
6	VBAT	Power supply for charge pump regulator circuit.内部升压基准电压
7,10	NC	No connection 不连接
8	VSS	This is a ground pin 外部接地
9	VDD	Power supply pin for core logic operation.逻辑电压
11	BS1	MCU bus interface selection pins.接口模式选择脚
12	BS2	
13	CS	This is the chip select input.(active LOW)片选脚
14	RES	Reset signal input.when the pin is pulled LOW,initialization of the chip is excute. Keep this pin HIGH(i.e connect to VDD)during normal operation 复位脚
15	A0	This is Data/Command control pin. When it is pulled HIGH (i.e. connect to VDD), the data at D[7:0] is treated as data. When it is pulled LOW, the data at D[7:0] will be transferred to the command register. In I2C mode, this pin acts as SA0 for slave address selection. When 3-wire serial interface is selected, this pin must be connected to VSS. 数据命令选择脚。当接口为 IIC 模式下，作为地址脚。
16	WR	This is read / write control input pin connecting to the MCU interface. When 8080 interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled LOW and the chip is selected.当为 8080 接口时，为数据写功能。

17	RD	<p>When connecting to an 8080-series microprocessor, this pin receives the Read (RD#) signal. Readoperation is initiated when this pin is pulled LOW and the chip is selected.</p> <p>When serial or I2C interface is selected, this pin must be connected to VSS. 当为 8080 接口时，为数据写功能。</p>
18 ~25	D0 ~D7	<p>These are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial interface mode is selected, D0 will be the serial clock input: SCLK; D1 will be the serialdata input: SDIN and D2 should be kept NC.</p> <p>When I2C mode is selected, D2, D1 should be tied together and serve as SDAout, SDAin in application and D0 is the serial clock input, SCL.</p> <p>数据总线。</p>
26	IREF	<p>This is segment output current reference pin.</p> <p>When external IREF is used, a resistor should be connected between this pin and VSS to maintain the IREF current at 30uA.</p> <p>When internal IREF is used, this pin should be kept NC.</p> <p>Seg 线参考电流点。可以通过修改指令实现内外部 Iref 设置。</p>
27	VCOMH	<p>The pin for COM signal deselected voltage level.</p> <p>A capacitor should be connected between this pin and VSS.Com 线非选通电平参考点。</p>
28	VCC	<p>Power supply for panel driving voltage. This is also the most positive power voltage supply pin.When charge pump is enabled, a capacitor should be connected between this pin and VSS.</p> <p>OLED 驱动电压。</p>
29,30	NC	No connection 不连接

Status	VBAT	VDD	VCC
Enable Charge pump	Connect to external VBAT source	Connect to external VDD source	A capacitor should be connected between this pin and VSS
Disable Charge pump	Keep float	Connect to external VDD source	Connect to external VCC source



## ■ COMMAND TABLE (指令表)

### SSD1315 Command Table

(D/C#=0, R/W#(WR#) = 0, E(RD#=1) unless specific setting is stated)

Fundamental Command Table											
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0	00~0F	0	0	0	0	X <sub>3</sub>	X <sub>2</sub>	X <sub>1</sub>	X <sub>0</sub>	Set Lower Column Start Address for Page Addressing Mode	Set the lower nibble of the column start address register for Page Addressing Mode using X[3:0] as data bits. The initial display line register is reset to 0000b after RESET.  <b>Note</b> (1) This command is only for page addressing mode
0	10~17	0	0	0	1	0	X <sub>2</sub>	X <sub>1</sub>	X <sub>0</sub>	Set Higher Column Start Address for Page Addressing Mode	Set the higher nibble of the column start address register for Page Addressing Mode using X[2:0] as data bits. The initial display line register is reset to 0000b after RESET.  <b>Note</b> (1) This command is only for page addressing mode
0 0	20 A[1:0]	0 0	0 0	1 0	0 0	0 0	0 0	0 A <sub>1</sub>	0 A <sub>0</sub>	Set Memory Addressing Mode	A[1:0] = 00b, Horizontal Addressing Mode A[1:0] = 01b, Vertical Addressing Mode A[1:0] = 10b, Page Addressing Mode (RESET) A[1:0] = 11b, Invalid
0 0 0	21 A[6:0] B[6:0]	0 * *	0 A <sub>6</sub> B <sub>6</sub>	1 A <sub>5</sub> B <sub>5</sub>	0 A <sub>4</sub> B <sub>4</sub>	0 A <sub>3</sub> B <sub>3</sub>	0 A <sub>2</sub> B <sub>2</sub>	0 A <sub>1</sub> B <sub>1</sub>	1 A <sub>0</sub> B <sub>0</sub>	Set Column Address	Setup column start and end address A[6:0] : Column start address, range : 0-127d, (RESET=0d)  B[6:0] : Column end address, range : 0-127d, (RESET =127d)  <b>Note</b> (1) This command is only for horizontal or vertical addressing mode.
0 0 0	22 A[2:0] B[2:0]	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 A <sub>2</sub> B <sub>2</sub>	1 A <sub>1</sub> B <sub>1</sub>	0 A <sub>0</sub> B <sub>0</sub>	Set Page Address	Setup page start and end address A[2:0] : Page start Address, range : 0-7d, (RESET = 0d)  B[2:0] : Page end Address, range : 0-7d, (RESET = 7d)  <b>Note</b> (1) This command is only for horizontal or vertical addressing mode.
0	40~7F	0	1	X <sub>5</sub>	X <sub>4</sub>	X <sub>3</sub>	X <sub>2</sub>	X <sub>1</sub>	X <sub>0</sub>	Set Display Start Line	Set display RAM display start line register from 0-63 using X <sub>5</sub> X <sub>4</sub> X <sub>3</sub> X <sub>2</sub> X <sub>1</sub> X <sub>0</sub> . Display start line register is reset to 000000b during RESET.

Fundamental Command Table											
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0 0	81 A[7:0]	1 A <sub>7</sub>	0 A <sub>6</sub>	0 A <sub>5</sub>	0 A <sub>4</sub>	0 A <sub>3</sub>	0 A <sub>2</sub>	0 A <sub>1</sub>	1 A <sub>0</sub>	Set Contrast Control	Double byte command to select one of the contrast steps. Contrast increases as the value increases. (RESET = 7Fh) A[7:0] valid range: 01h to FFh
0	A0/A1	1	0	1	0	0	0	0	X <sub>0</sub>	Set Segment Re-map	A0h, X[0]=0b: column address 0 is mapped to SEG0 (RESET)  A1h, X[0]=1b: column address 127 is mapped to SEG0
0	A4/A5	1	0	1	0	0	1	0	X <sub>0</sub>	Entire Display ON	A4h, X <sub>0</sub> =0b: Resume to RAM content display (RESET) Output follows RAM content  A5h, X <sub>0</sub> =1b: Entire display ON Output ignores RAM content
0	A6/A7	1	0	1	0	0	1	1	X <sub>0</sub>	Set Normal/Inverse Display	A6h, X[0]=0b: Normal display (RESET) 0 in RAM: OFF in display panel 1 in RAM: ON in display panel  A7h, X[0]=1b: Inverse display 0 in RAM: ON in display panel 1 in RAM: OFF in display panel
0 0	A8 A[7:0]	1 *	0 *	1 A <sub>5</sub>	0 A <sub>4</sub>	1 A <sub>3</sub>	0 A <sub>2</sub>	0 A <sub>1</sub>	0 A <sub>0</sub>	Set Multiplex Ratio	Set MUX ratio to N+1 MUX  N=A[5:0] : from 16MUX to 64MUX. RESET = 111111b (i.e. 63d, 64MUX) A[5:0] from 0 to 14 are invalid entry
0 0	AD A[5:4]	1 0	0 0	1 A <sub>5</sub>	0 A <sub>4</sub>	1 0	1 0	0 0	1 0	Internal I <sub>REF</sub> Setting	Select external or internal I <sub>REF</sub> : A[4] = '0': Select external I <sub>REF</sub> (RESET) A[4] = '1': Enable internal I <sub>REF</sub> during display ON  Internal I <sub>REF</sub> value setting: A[5] = '0': Internal IREF setting: 19uA, output a maximum I <sub>SEG</sub> =150uA (RESET) A[5] = '1': Internal IREF setting: 30uA, output a maximum I <sub>SEG</sub> =240uA
0	AE/AF	1	0	1	0	1	1	1	X <sub>0</sub>	Set Display ON/OFF	AEh, X[0]=0b: Display OFF (sleep mode) (RESET)  AFh X[0]=1b: Display ON in normal mode
0	B0~B7	1	0	1	1	0	X <sub>2</sub>	X <sub>1</sub>	X <sub>0</sub>	Set Page Start Address for Page Addressing Mode	Set GDDRAM Page Start Address PAGE0~PAGE7 for Page Addressing Mode using X[2:0].  <b>Note</b> (1) This command is only for page addressing mode

Fundamental Command Table																										
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description															
00	C0/C8	1	1	0	0	X <sub>3</sub>	0	0	0	Set COM Output Scan Direction	C0h, X[3]=0b: normal mode (RESET) Scan from COM0 to COM[N -1] C8h, X[3]=1b: remapped mode. Scan from COM[N-1] to COM0 Where N is the Multiplex ratio.															
00	D3 A[5:0]	1 *	1 *	0 A <sub>5</sub>	1 A <sub>4</sub>	0 A <sub>3</sub>	0 A <sub>2</sub>	1 A <sub>1</sub>	1 A <sub>0</sub>	Set Display Offset	Set vertical shift by COM from 0d~63d. The value is reset to 00h after RESET.															
00	D5 A[7:0]	1 A <sub>7</sub>	1 A <sub>6</sub>	0 A <sub>5</sub>	1 A <sub>4</sub>	0 A <sub>3</sub>	1 A <sub>2</sub>	0 A <sub>1</sub>	1 A <sub>0</sub>	Set Display Clock Divide Ratio/Oscillator Frequency	A[3:0] : Define the divide ratio (D) of the display clocks (DCLK): Divide ratio= A[3:0] + 1, RESET is 0000b (divide ratio = 1)  A[7:4] : Set the Oscillator Frequency, F <sub>OSC</sub> . Oscillator Frequency increases with the value of A[7:4] and vice versa. RESET is 1000b. Range: 0000b~1111b. Frequency increases as setting value increases.															
00	D9 A[7:0]	1 A <sub>7</sub>	1 A <sub>6</sub>	0 A <sub>5</sub>	1 A <sub>4</sub>	1 A <sub>3</sub>	0 A <sub>2</sub>	0 A <sub>1</sub>	1 A <sub>0</sub>	Set Pre-charge Period	A[3:0] : Phase 1 period of up to 30 DCLK (i.e. 2, 4, 6, ··30) Clocks 0 is invalid entry (RESET=2h)  A[7:4] : Phase 2 period of up to 30 DCLK (i.e. 2, 4, 6, ··30) Clocks 0 is invalid entry (RESET=2h )															
00	DA A[5:4]	1 0	1 0	0 A <sub>5</sub>	1 A <sub>4</sub>	1 0	0 0	1 1	0 0	Set COM Pins Hardware Configuration	A[4]=0b, Sequential COM pin configuration A[4]=1b (RESET), Alternative COM pin Configuration  A[5]=0b (RESET), Disable COM Left/Right remap A[5]=1b, Enable COM Left/Right remap															
00	DB A[5:4]	1 0	1 0	0 A <sub>5</sub>	1 A <sub>4</sub>	1 0	0 0	1 0	1 0	Set V <sub>COMH</sub> select Level	Set COM select voltage level. <table border="1"><thead><tr><th>A[5:4]</th><th>Hex code</th><th>V<sub>COMH</sub> deselect level</th></tr></thead><tbody><tr><td>00b</td><td>00h</td><td>~ 0.65 x V<sub>CC</sub></td></tr><tr><td>01b</td><td>10h</td><td>~ 0.71 x V<sub>CC</sub></td></tr><tr><td>10b</td><td>20h</td><td>~ 0.77 x V<sub>CC</sub> (RESET)</td></tr><tr><td>11b</td><td>30h</td><td>~ 0.83 x V<sub>CC</sub></td></tr></tbody></table>	A[5:4]	Hex code	V <sub>COMH</sub> deselect level	00b	00h	~ 0.65 x V <sub>CC</sub>	01b	10h	~ 0.71 x V <sub>CC</sub>	10b	20h	~ 0.77 x V <sub>CC</sub> (RESET)	11b	30h	~ 0.83 x V <sub>CC</sub>
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11b	30h	~ 0.83 x V <sub>CC</sub>																								
00	E3	1	1	1	0	0	0	1	1	NOP	Command for no operation															

**Internal Charge Pump Command Table**

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description															
0	8D	1	0	0	0	1	1	0	1	Charge	Enable / Disable internal charge pump: A[2] = 0b, Disable charge pump (RESET) A[2] = 1b, Enable charge pump during display on															
0	A[7:0]	A <sub>7</sub>	0	0	1	0	A <sub>2</sub>	0	A <sub>0</sub>	Pump Setting																
<table><tr><th>A[7]</th><th>A[0]</th><th>Hex code</th><th>Charge Pump Mode</th></tr><tr><td>0b</td><td>0b</td><td>14h</td><td>7.5V (RESET)</td></tr><tr><td>1b</td><td>0b</td><td>94h</td><td>8.5V</td></tr><tr><td>1b</td><td>1b</td><td>95h</td><td>9.0V</td></tr></table>												A[7]	A[0]	Hex code	Charge Pump Mode	0b	0b	14h	7.5V (RESET)	1b	0b	94h	8.5V	1b	1b	95h
A[7]	A[0]	Hex code	Charge Pump Mode																							
0b	0b	14h	7.5V (RESET)																							
1b	0b	94h	8.5V																							
1b	1b	95h	9.0V																							
<b>Note</b> (1) The Charge Pump must be enabled by the following command sequence: 8Dh ; Charge Pump Setting 14h / 94h / 95h ; Enable Charge Pump AFh; Display ON																										

Scrolling Command Table

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description									
0	26/27	0	0	1	0	0	1	1	X <sub>0</sub>	Continuous	26h, X[0]=0, Right Horizontal Scroll									
0	A[7:0]	0	0	0	0	0	0	0	0	Horizontal Scroll	27h, X[0]=1, Left Horizontal Scroll									
0	B[2:0]	0	0	0	0	0	B <sub>2</sub>	B <sub>1</sub>	B <sub>0</sub>	Setup	(Horizontal scroll by 1 column)									
0	C[2:0]	0	0	0	0	0	C <sub>2</sub>	C <sub>1</sub>	C <sub>0</sub>											
0	D[2:0]	0	0	0	0	0	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>											
0	E[7:0]	0	E <sub>6</sub>	E <sub>5</sub>	E <sub>4</sub>	E <sub>3</sub>	E <sub>2</sub>	E <sub>1</sub>	E <sub>0</sub>		A[7:0] : Dummy byte (Set as 00h)									
0	F[7:0]	0	F <sub>6</sub>	F <sub>5</sub>	F <sub>4</sub>	F <sub>3</sub>	F <sub>2</sub>	F <sub>1</sub>	F <sub>0</sub>		B[2:0] : Define start page address									
											<table><tr><td>000b -PAGE0</td><td>011b -PAGE3</td><td>110b -PAGE6</td></tr><tr><td>001b -PAGE1</td><td>100b -PAGE4</td><td>111b -PAGE7</td></tr><tr><td>010b -PAGE2</td><td>101b -PAGE5</td><td></td></tr></table>	000b -PAGE0	011b -PAGE3	110b -PAGE6	001b -PAGE1	100b -PAGE4	111b -PAGE7	010b -PAGE2	101b -PAGE5	
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010b -PAGE2	101b -PAGE5																			
											C[2:0] : Set time interval between each scroll step in terms of frame frequency									
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000b -PAGE0	011b -PAGE3	110b -PAGE6																		
001b -PAGE1	100b -PAGE4	111b -PAGE7																		
010b -PAGE2	101b -PAGE5																			
											E[6:0] : Define start column address (RESET = 00h)									
											F[6:0] : Define end column address (RESET = 7Fh)									
											<b>Notes:</b> ( <sup>1</sup> ) The value of D[2:0] must be larger than or equal to B[2:0] ( <sup>2</sup> ) The value of F[6:0] must be larger than or equal to E[6:0]									

Scrolling Command Table

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description																										
0	29/2A	0	0	1	0	1	0	X <sub>1</sub>	X <sub>0</sub>	Continuous	29h, X <sub>1</sub> X <sub>0</sub> =01b : Vertical and Right Horizontal Scroll																										
0	A[2:0]	0	0	0	0	0	0	0	A <sub>0</sub>	Vertical and	2Ah, X <sub>1</sub> X <sub>0</sub> =10b : Vertical and Left Horizontal Scroll																										
0	B[2:0]	0	0	0	0	0	0	B <sub>2</sub>	B <sub>1</sub>	B <sub>0</sub>	Horizontal Scroll																										
0	C[2:0]	0	0	0	0	0	0	C <sub>2</sub>	C <sub>1</sub>	C <sub>0</sub>	Setup																										
0	D[2:0]	0	0	0	0	0	0	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>	A[0] : Set number of column scroll offset 0b No horizontal scroll 1b Horizontal scroll by 1 column																										
0	E[5:0]	0	0	E <sub>5</sub>	E <sub>4</sub>	E <sub>3</sub>	E <sub>2</sub>	E <sub>1</sub>	E <sub>0</sub>																												
0	F[5:0]	0	F <sub>6</sub>	F <sub>5</sub>	F <sub>4</sub>	F <sub>3</sub>	F <sub>2</sub>	F <sub>1</sub>	F <sub>0</sub>																												
0	G[5:0]	0	G <sub>6</sub>	G <sub>5</sub>	G <sub>4</sub>	G <sub>3</sub>	G <sub>2</sub>	G <sub>1</sub>	G <sub>0</sub>																												
											B[2:0] : Define start page address <table><tr><td>000b -PAGE0</td><td>011b -PAGE3</td><td>110b -PAGE6</td></tr><tr><td>001b -PAGE1</td><td>100b -PAGE4</td><td>111b -PAGE7</td></tr><tr><td>010b -PAGE2</td><td>101b -PAGE5</td><td></td></tr></table> C[2:0] : Set time interval between each scroll step in terms of frame frequency <table><tr><td>000b -6 frames</td><td>100b -3 frames</td></tr><tr><td>001b -32 frames</td><td>101b -4 frames</td></tr><tr><td>010b -64 frames</td><td>110b -5 frame</td></tr><tr><td>011b -128 frames</td><td>111b -2 frame</td></tr></table> D[2:0] : Define end page address <table><tr><td>000b -PAGE0</td><td>011b -PAGE3</td><td>110b -PAGE6</td></tr><tr><td>001b -PAGE1</td><td>100b -PAGE4</td><td>111b -PAGE7</td></tr><tr><td>010b -PAGE2</td><td>101b -PAGE5</td><td></td></tr></table> E[5:0] : Vertical scrolling offset e.g. E[5:0]= 01h refer to offset =1 row E[5:0] =3Fh refer to offset =63 rows  F[6:0] : Define the start column address (RESET = 00h)  G[6:0] : Define the end column address (RESET = 7Fh)  <b>Note</b> ( <sup>1</sup> ) The value of D[2:0] must be larger than or equal to B[2:0] ( <sup>2</sup> ) The value of E[5:0] must be less than B[6:0] in A3h ( <sup>3</sup> ) The value of G[6:0] must be larger than or equal to F[6:0]	000b -PAGE0	011b -PAGE3	110b -PAGE6	001b -PAGE1	100b -PAGE4	111b -PAGE7	010b -PAGE2	101b -PAGE5		000b -6 frames	100b -3 frames	001b -32 frames	101b -4 frames	010b -64 frames	110b -5 frame	011b -128 frames	111b -2 frame	000b -PAGE0	011b -PAGE3	110b -PAGE6	001b -PAGE1	100b -PAGE4	111b -PAGE7	010b -PAGE2	101b -PAGE5	
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Scrolling Command Table											
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
0	2E	0	0	1	0	1	1	1	0	Deactivate scroll	<p>Stop scrolling that is configured by command 26h/27h/29h/2Ah.</p> <p><b>Note</b>  <sup>(1)</sup> After sending 2Eh command to deactivate the scrolling action, the ram data needs to be rewritten.</p>
0	2F	0	0	1	0	1	1	1	1	Activate scroll	<p>Start scrolling that is configured by the scrolling setup commands :26h/27h/29h/2Ah with the following valid sequences:</p> <p>Valid command sequence 1: 26h ;2Fh.  Valid command sequence 2: 27h ;2Fh.  Valid command sequence 3: 29h ;2Fh.  Valid command sequence 4: 2Ah ;2Fh.</p> <p>For example, if “26h; 2Ah; 2Fh.” commands issued, the setting in the last scrolling setup command, i.e. 2Ah in this case, will be executed. In other words, setting in the last scrolling setup command overwrites the setting in the previous scrolling setup commands.</p>
000	A3 A[5:0] B[6:0]	1 0 0	0 0 B <sub>6</sub>	1 A <sub>5</sub> B <sub>5</sub>	0 A <sub>4</sub> B <sub>4</sub>	0 A <sub>3</sub> B <sub>3</sub>	0 A <sub>2</sub> B <sub>2</sub>	1 A <sub>1</sub> B <sub>1</sub>	1 A <sub>0</sub> B <sub>0</sub>	Set Vertical Scroll Area	<p>A[5:0] : Set No. of rows in top fixed area. The No. of rows in top fixed area is referenced to the top of the GDDRAM (i.e. row 0). [RESET = 0]</p> <p>B[6:0] : Set No. of rows in scroll area. This is the number of rows to be used for vertical scrolling. The scroll area starts in the first row below the top fixed area. [RESET = 64]</p> <p><b>Note</b>  <sup>(1)</sup> A[5:0]+B[6:0] &lt;= MUX ratio  <sup>(2)</sup> B[6:0] &lt;= MUX ratio  <sup>(3a)</sup> Vertical scrolling offset (E[5:0] in 29h/2Ah) &lt; B[6:0]  <sup>(3b)</sup> Set Display Start Line (X<sub>5</sub>X<sub>4</sub>X<sub>3</sub>X<sub>2</sub>X<sub>1</sub>X<sub>0</sub> of 40h~7Fh) &lt; B[6:0]  <sup>(4)</sup> The last row of the scroll area shifts to the first row of the scroll area.  <sup>(5)</sup> For 64d MUX display  A[5:0] = 0, B[6:0]=64 : whole area scrolls  A[5:0] = 0, B[6:0] &lt; 64 : top area scrolls  A[5:0] + B[6:0] &lt; 64 : central area scrolls  A[5:0] + B[6:0] = 64 : bottom area scrolls</p>

Scrolling Command Table										Command	Description									
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0											
0	2C/2D	0	0	1	0	1	1	0	X <sub>0</sub>	Content Scroll Setup	2Ch, X[0]=0, Right Horizontal Scroll by one column									
0	A[7:0]	0	0	0	0	0	0	0	0		2Dh, X[0]=1, Left Horizontal Scroll by one column									
0	B[2:0]	0	0	0	0	0	B <sub>2</sub>	B <sub>1</sub>	B <sub>0</sub>											
0	C[7:0]	0	0	0	0	0	0	0	1											
0	D[2:0]	0	0	0	0	0	D <sub>2</sub>	D <sub>1</sub>	D <sub>0</sub>		A[7:0] : Dummy byte (Set as 00h)									
0	E[7:0]	0	E <sub>6</sub>	E <sub>5</sub>	E <sub>4</sub>	E <sub>3</sub>	E <sub>2</sub>	E <sub>1</sub>	E <sub>0</sub>											
0	F[7:0]	0	F <sub>6</sub>	F <sub>5</sub>	F <sub>4</sub>	F <sub>3</sub>	F <sub>2</sub>	F <sub>1</sub>	F <sub>0</sub>											
											B[2:0] : Define start page address									
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000b -PAGE0	011b -PAGE3	110b -PAGE6																		
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											C[7:0] : Dummy byte (Set as 01h)									
											D[2:0] : Define end page address									
											<table><tr><td>000b -PAGE0</td><td>011b -PAGE3</td><td>110b -PAGE6</td></tr><tr><td>001b -PAGE1</td><td>100b -PAGE4</td><td>111b -PAGE7</td></tr><tr><td>010b -PAGE2</td><td>101b -PAGE5</td><td></td></tr></table>	000b -PAGE0	011b -PAGE3	110b -PAGE6	001b -PAGE1	100b -PAGE4	111b -PAGE7	010b -PAGE2	101b -PAGE5	
000b -PAGE0	011b -PAGE3	110b -PAGE6																		
001b -PAGE1	100b -PAGE4	111b -PAGE7																		
010b -PAGE2	101b -PAGE5																			
											E[6:0] : Define start column address (RESET = 00h)									
											F[6:0] : Define end column address (RESET = 7Fh)									
											<b>Note</b>									
											<sup>(1)</sup> The value of D[2:0] must be larger than or equal to B[2:0]									
											<sup>(2)</sup> The value of F[6:0] must be larger than E[6:0]									
											<sup>(3)</sup> A delay time of 2 frame frequency must be set if sending the command of 2Ch / 2Dh consecutively									



Advance Graphic Command Table																							
D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description												
00	23 A[5:0]	0 *	0 *	1 A <sub>5</sub>	0 A <sub>4</sub>	0 A <sub>3</sub>	0 A <sub>2</sub>	1 A <sub>1</sub>	1 A <sub>0</sub>	Set Fade Out and Blinking	<p>A[5:4] = 00b Disable Fade Out / Blinking Mode[RESET]</p> <p>A[5:4] = 10b Enable Fade Out mode. Once Fade Out mode is enabled, contrast decrease gradually to all pixels OFF. Output follows RAM content when Fade mode is disabled.</p> <p>A[5:4] = 11b Enable Blinking mode. Once Blinking mode is enabled, contrast decrease gradually to all pixels OFF and then contrast increase gradually to normal display. This process loop continuously until the Blinking mode is disabled.</p> <p>A[3:0] : Set time interval for each fade step</p> <table><tr><td>A[3:0]</td><td>Time interval for each fade step</td></tr><tr><td>0000b</td><td>8 Frames</td></tr><tr><td>0001b</td><td>16 Frames</td></tr><tr><td>0010b</td><td>24 Frames</td></tr><tr><td colspan="2">:</td></tr><tr><td>1111b</td><td>128 Frames</td></tr></table> <p>Note (1) Refer to section 1.4.1 for details.</p>	A[3:0]	Time interval for each fade step	0000b	8 Frames	0001b	16 Frames	0010b	24 Frames	:		1111b	128 Frames
A[3:0]	Time interval for each fade step																						
0000b	8 Frames																						
0001b	16 Frames																						
0010b	24 Frames																						
:																							
1111b	128 Frames																						
00	D6 A[0]	1 *	1 *	0 *	1 *	0 *	1 *	1 *	0 A <sub>0</sub>	Set Zoom In	<p>A[0] = 0b Disable Zoom in Mode [RESET]</p> <p>A[0] = 1b Enable Zoom in Mode</p> <p>Note (1) The panel must be in alternative COM pin configuration (command DAh A[4]=1) (2) Refer to section 1.4.2 for details.</p>												

**Note**

(1) “\*” stands for “Don’ t care” .

**■ INITIALIZATION CODE (初始化代码)**

```
void InitOLED_SSD1315(void)
```

```
{  
    MainOLED_WCom(0xAE);          //DISPLAY OFF  
  
    //Fundamental command  
    MainOLED_WCom(0X81);  
    MainOLED_WCom(0xCF); //SET CONTRAST  
  
    MainOLED_WCom(0XA4);          //Entire Display ON A4~A5  
  
    MainOLED_WCom(0XA6);          //Set Normal/Inverse Display A6(Normal) A7(Inverse)  
  
    //Addressing Setting  
    MainOLED_WCom(0x00);          //Set lower Column Start Address for Page Addressing Mode  
    MainOLED_WCom(0x10);          //Set Higher Column Start Address for Page Addressing Mode  
  
    MainOLED_WCom(0X20);          //Set Memory Addressing Mode 0x01 Vertical Addressing Mode  
    MainOLED_WCom(0X02);          //0x00:Horizontal Addressing Mode 0x02:Page Addressing mode  
  
    MainOLED_WCom(0XB0);          //Start Page only for page addressing mode  
  
    //Hardware Configuration  
    MainOLED_WCom(0X40);          //Start Line  
  
    MainOLED_WCom(0XA0);          //Set Segment Re-map A0-A1  
  
    MainOLED_WCom(0XA8);          //Set Multiplex Ratio  
    MainOLED_WCom(0X3F);  
  
    MainOLED_WCom(0XC0);          //Set COM Output Scan Direction C0,C8  
  
    MainOLED_WCom(0XD3);          //Set Display Offset  
    MainOLED_WCom(0X00);  
  
    MainOLED_WCom(0XDA);          //Set COM Pins Hardware Configuration  
    MainOLED_WCom(0X12);  
  
    //TIMING &Driving Scheme setting  
    MainOLED_WCom(0XD5);          //Set Display Clock Divide  
    MainOLED_WCom(0X80);  
  
    MainOLED_WCom(0XD9);          //Set Pre-charge Period  
    MainOLED_WCom(0X22);  
  
    MainOLED_WCom(0XDB);          //Set Vcomh Deselect Level  
    MainOLED_WCom(0X40);
```

```
//Charge Pump Command  
MainOLED_WCom(0X8D);  
MainOLED_WCom(0X14);    //Enable Charge Pump,0X14/7.5V
```

```
//internal Iref  
MainOLED_WCom(0XAD);  
MainOLED_WCom(0X30);    //enable internal Iref 30uA
```

```
MainOLED_WCom(0xAF);    //DISPLAY ON
```

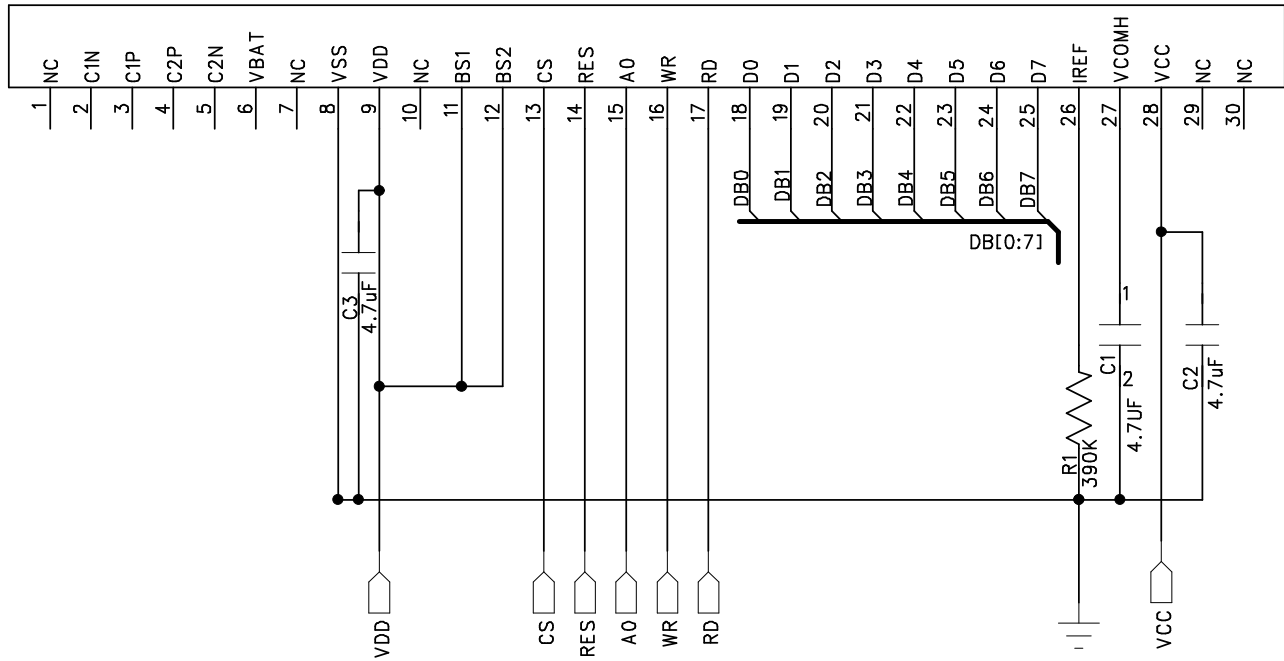
**}Note:**

Please set appropriate parameters of initialization based on actual application.

注意：请基于实际的应用程序设置合适的初始化的参数。

## ■ SCHEMATIC EXAMPLE 应用电路

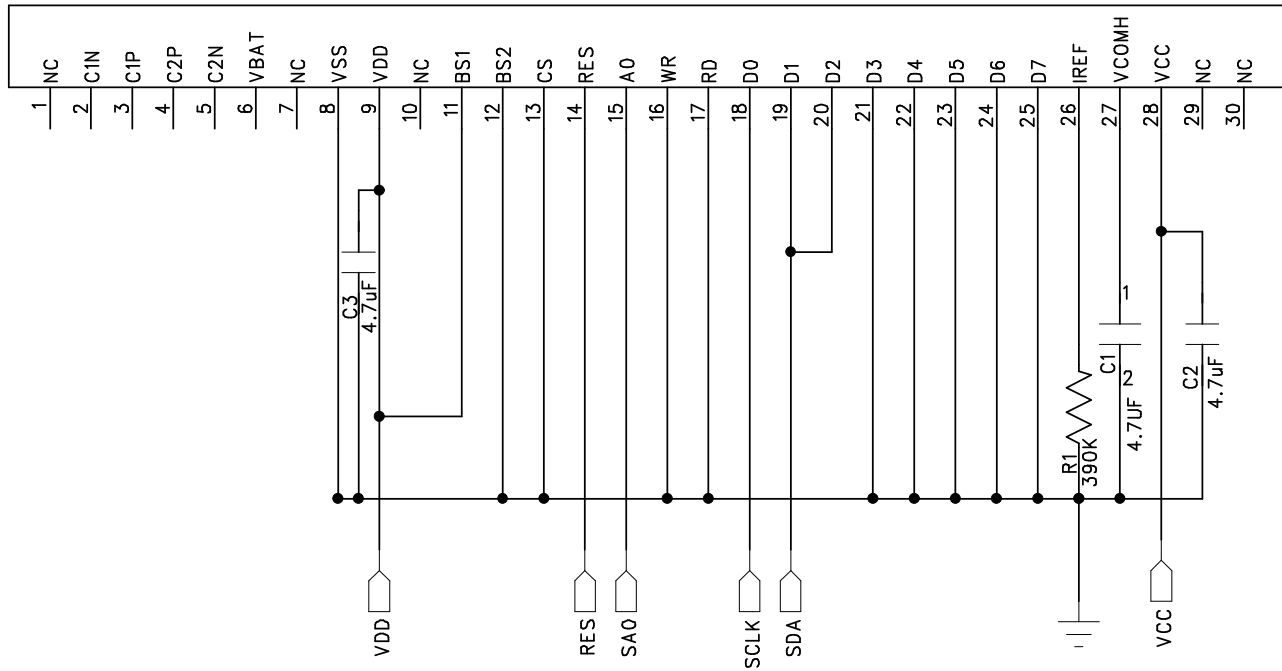
### ◆ 8080 Interface Application Circuit ( External VCC)



#### NOTE:

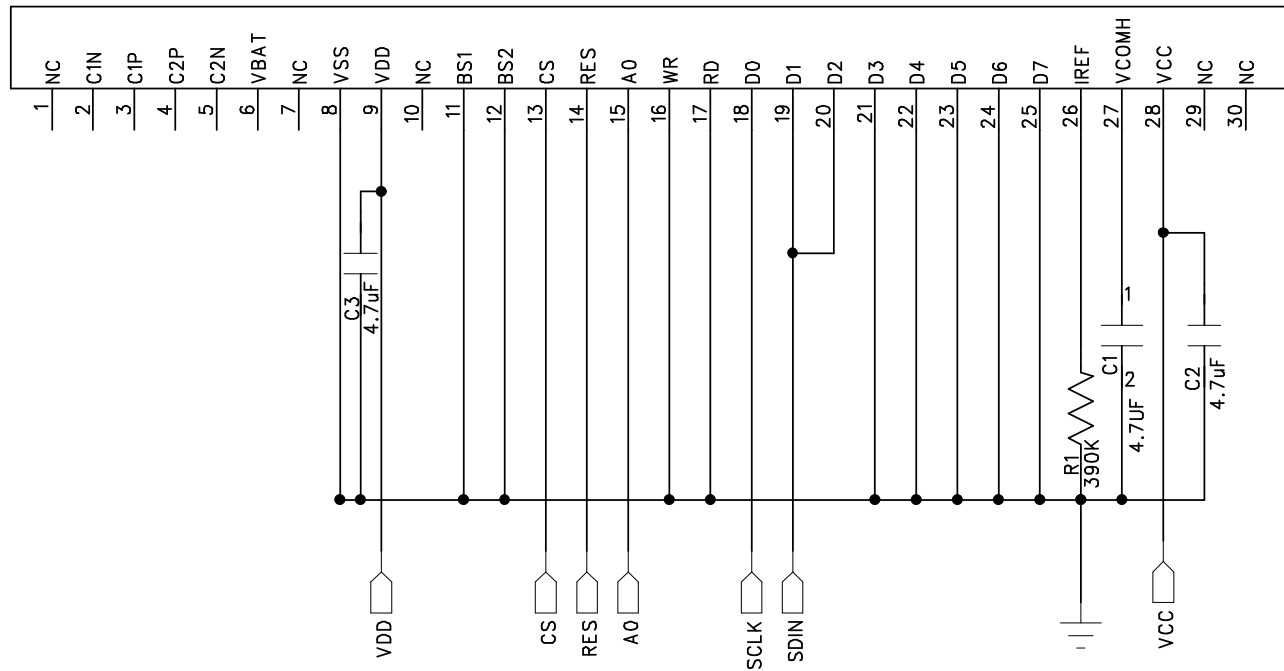
1. R1: about 390 K $\Omega$ ,  $R1 = (\text{Voltage at IREF} - VSS)/IREF$   
C1=4.7uF(Tan);C2=C3 =4.7uF;
2. TheVDD、 VCC should connect an external voltage.  
VDD、VCC 应连接到外部电压。
3. The capacitor and the resistor value are recommended value. Select the appropriate value against module application. The capacitor connecting to the VCOM (C1)suggests using tantalum capacitor.  
电容和电阻的值仅为推荐的值，根据模块的实际应用选择合适的值。C1 推荐采用钽电容。

## ◆ IIC Interface Application Circuit ( External VCC)

**NOTE:**

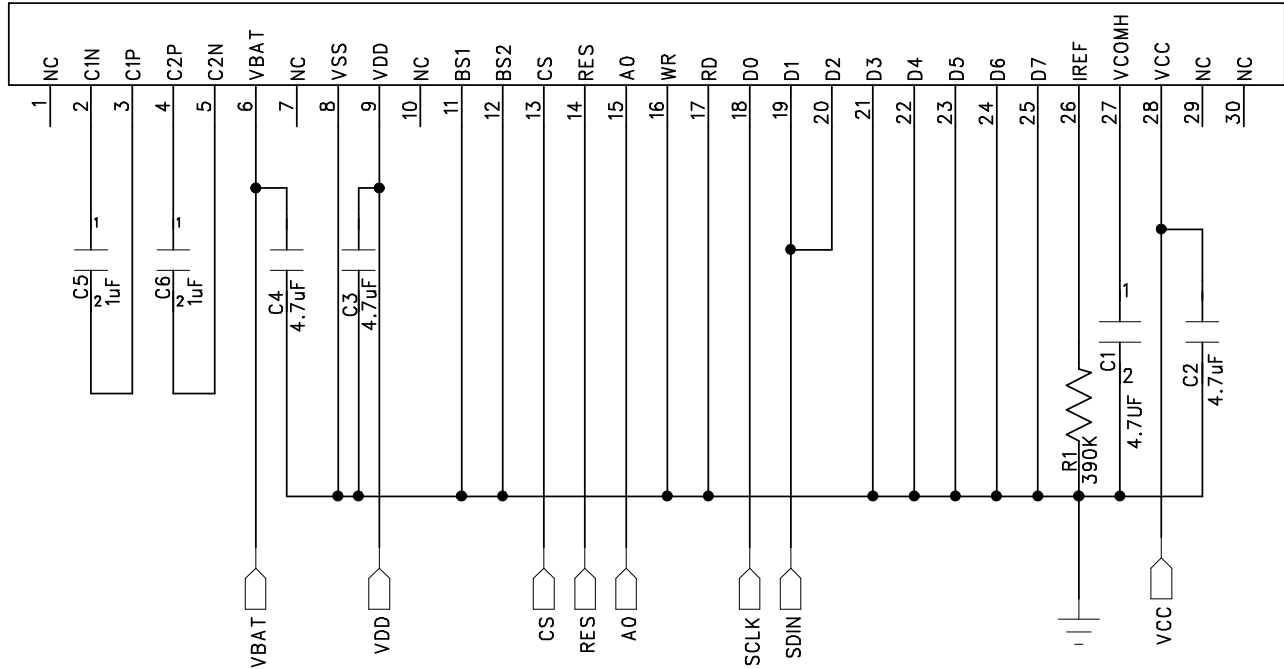
1. R1: about 390 K $\Omega$ ,  $R1 = (\text{Voltage at IREF} - VSS)/I_{REF}$   
 $C1=4.7\mu F(\text{Tan}); C2=C3=4.7\mu F$ ;
2. The VDD、 VCC should connect an external voltage.  
VDD、 VCC 应连接到外部电压。
3. The capacitor and the resistor value are recommended value. Select the appropriate value against module application. The capacitor connecting to the VCOM (C1)suggests using tantalum capacitor.  
电容和电阻的值仅为推荐的值，根据模块的实际应用选择合适的值。C1 推荐采用钽电容。

## ◆ 4-SPI Interface Application Circuit ( External VCC)

**NOTE:**

1. R1: about 390 K $\Omega$ ,  $R1 = (\text{Voltage at IREF} - VSS)/IREF$   
 $C1=4.7\mu F(\text{Tan}); C2=C3=4.7\mu F$ ;
2. The VDD、 VCC should connect an external voltage.  
 VDD、 VCC 应连接到外部电压。
3. The capacitor and the resistor value are recommended value. Select the appropriate value against module application. The capacitor connecting to the VCOM (C1)suggests using tantalum capacitor.  
 电容和电阻的值仅为推荐的值，根据模块的实际应用选择合适的值。C1 推荐采用钽电容。

## ◆ 4-SPI Interface Application Circuit ( Internal Charge Pump )

**NOTE:**

1. R1: about 390 K $\Omega$ ,  $R1 = (\text{Voltage at IREF} - VSS)/IREF$   
C1=4.7uF(Tan);C2=C3=C4=4.7uF; C5=C6=1uF.
2. VDD、 VBAT should connect an external voltage.  
VDD、 VBAT 应连接到外部电压。
3. The capacitor and the resistor value are recommended value. Select the appropriate value against module application. The capacitor connecting to the VCOMH (C1)suggests using tantalum capacitor.  
电容和电阻的值仅为推荐的值，根据模块的实际应用选择合适的值。C1 推荐采用钽电容。

**■ RELIABILITY TESTS (可靠性测试)**

NO.	Item	Condition	Quantity
1	High Temperature Storage (HTS)	$85\pm 2^{\circ}\text{C}$ , 200 hours	3
2	High Temperature Operating (HTO)	$70\pm 2^{\circ}\text{C}$ , 96 hours	3
3	Low Temperature Storage (LTS)	$-40\pm 2^{\circ}\text{C}$ , 200 hours	3
4	Low Temperature Operating (LTO)	$-40\pm 2^{\circ}\text{C}$ , 96 hours	3
5	High Temperature / High Humidity Storage (HTHHS)	$50\pm 3^{\circ}\text{C}$ , $90\%\pm 3\%\text{RH}$ , 120 hours	3
6	Thermal Shock (Non-operation) (TS)	$-20\pm 2^{\circ}\text{C} \sim 25^{\circ}\text{C} \sim 70\pm 2^{\circ}\text{C}$ (30min) (5min) (30min) 10cycles	3
7	Vibration (Packing)	10~55~10Hz, amplitude 1.5mm, 1 hour for each direction x, y, z	1 Carton
8	Drop (Packing)	Height : 1 m, each time for 6 sides, 3 edges, 1 angle	1 Carton
9	ESD (finished product housing)	$\pm 4\text{kVR}$ :330 $\Omega$ ; C:150pF 10times, air discharge	3

**Test and measurement conditions (测试与测量条件)**

1. All measurements shall not be started until the specimens attain to temperature stability.
2. The degradation of Polarizer are ignored for item 1, 2 & 5.

**Evaluation criteria (评估标准)**

1. The function test is ok.
2. No addition to the defect.
3. The change of luminance should be within  $\pm 50\%$  of initial value.
4. The change for the color must be within ( $\pm 0.02$ ) of initial value based on 1931 CIE coordinates.
5. The change of total current consumption should be within  $\pm 50\%$  of initial value.
6. In case of malfunction or defect caused by ESD damage, it would be judged as a good part if it would be recovered to normal state after resetting.

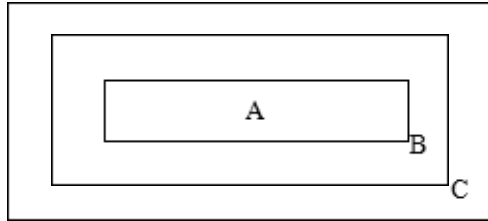


**■ OUTGOING QUALITY CONTROL SPECIFICATION (出厂质量控制规范)****◆ Standard (标准)**

According to GB/T2828.1-2003/ISO 2859-1: 1999 and ANSI/ASQC Z1.4-1993, General Inspection Level II.

**◆ Definition (定义)**

1. Major defect: The defect that greatly affect the usability of product.
2. Minor defect: The other defects, such as cosmetic defects, etc.
3. Definition of inspection zone:



Zone A: Active Area

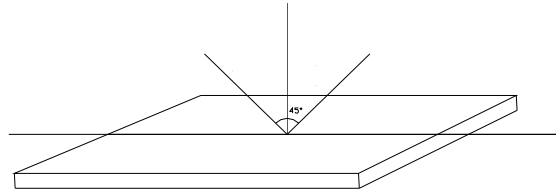
Zone B: Viewing Area except Zone A

Zone C: Outside Viewing Area

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble of quality and assembly to customer's product.

**◆ Inspection Methods (检查方法)**

1. The general inspection: under 20W x 2 or 40W fluorescent light, about 30cm viewing distance, within 45° viewing angle, under 25±5°C.



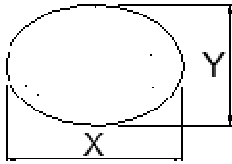
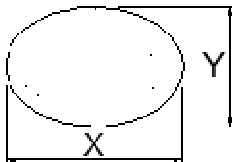
2. The luminance and color coordinate inspection: By CS2000/09A-OLED-117 or the equal equipment, in the dark room, under 25±5°C.

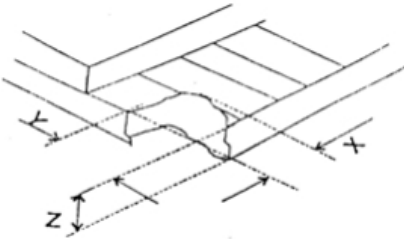
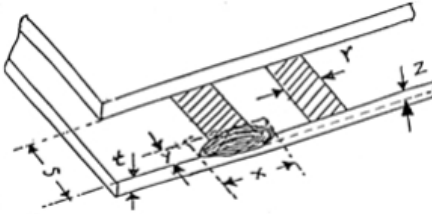
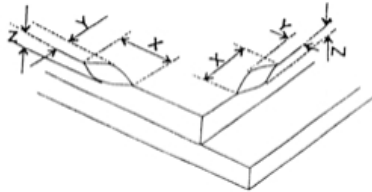
**◆ Inspection Criteria (检查标准)**

1. Major defect: AQL= 0.65

Item	Criterion
Function Defect	1. No display or abnormal display is not accepted
	2. Open or short is not accepted.
	3. Power consumption exceeding the spec is not accepted.
Outline Dimension	Outline dimension exceeding the spec is not accepted.
Glass Crack	Glass crack tends to enlarge is not accepted.

## 2. Minor Defect: AQL= 1.5

Item	Criterion			
Spot Defect (dimming and lighting spot)	Size (mm)		Accepted Qty.	
			Area A + Area B	Area C
		$\Phi \leq 0.07$	Ignored	
		$0.07 < \Phi \leq 0.10$	3	Ignored
		$0.10 < \Phi \leq 0.15$	1	
		$0.15 < \Phi$	0	
Note : $\Phi = (x + y) / 2$				
Line Defect (dimming and lighting line)	L ( Length ) : mm	W ( Width ) : mm	Area A + Area B	Area C
	/	$W \leq 0.02$	Ignored	
	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	Ignored
	$L \leq 2.0$	$0.03 < W \leq 0.05$	1	
	/	$0.05 < W$	As spot defect	
Remarks: The total of spot defect and line defect shall not exceed 4 PCS. The distance between two lines defects must exceed 1 mm				
Polarizer Stain	Stain which can be wiped off lightly with a soft cloth or similar cleaning is accepted, otherwise, according to the Spot Defect and the Line Defect.			
Polarizer Scratch	1. If scratch can be seen during operation, according to the criterions of the Spot Defect and the Line Defect.			
	2. If scratch can be seen only under non-operation or some special angle, the criterion is as below:			
	L ( Length ) : mm	W ( Width ) : mm	Area A + Area B	Area C
	/	$W \leq 0.02$	Ignore	
	$3.0 < L \leq 5.0$	$0.02 < W \leq 0.04$	2	Ignore
	$L \leq 3.0$	$0.04 < W \leq 0.06$	1	
/	$0.06 < W$	0		
Polarizer Air Bubble	Size		Area A + Area B	Area C
		$\Phi \leq 0.20$	Ignored	
		$0.20 < \Phi \leq 0.30$	2	Ignored
		$0.30 < \Phi \leq 0.50$	1	
		$0.50 < \Phi$	0	

Glass Defect (Glass Chipped)	1. on the corner (mm)		<table><tr><td>x</td><td>≤ 1.5</td></tr><tr><td>y</td><td>≤ 1.5</td></tr><tr><td>z</td><td>≤ t</td></tr></table>	x	≤ 1.5	y	≤ 1.5	z	≤ t
	x	≤ 1.5							
	y	≤ 1.5							
	z	≤ t							
2. On the bonding edge (mm)		<table><tr><td>x</td><td>≤ a/4</td></tr><tr><td>y</td><td>≤ s/3 &amp; ≤0.7</td></tr><tr><td>z</td><td>≤ t</td></tr></table>	x	≤ a/4	y	≤ s/3 & ≤0.7	z	≤ t	
x	≤ a/4								
y	≤ s/3 & ≤0.7								
z	≤ t								
3. On the other edges (mm)		<table><tr><td>x</td><td>≤ a / 8</td></tr><tr><td>y</td><td>≤ 0.7</td></tr><tr><td>z</td><td>≤ t</td></tr></table>	x	≤ a / 8	y	≤ 0.7	z	≤ t	
x	≤ a / 8								
y	≤ 0.7								
z	≤ t								
Note: t: glass thickness; s: pad width; a: the length of the edge.									
TCP Defect	Crack, deep fold and deep pressure mark on the TCP are not accepted								
Pixel Size	The tolerance of display pixel dimension should be within ±20% of the spec.								
Luminance	Refer to the spec or the reference sample.								
Color	Refer to the spec or the reference sample.								

## ■ CAUTIONS IN USING OLED MODULE (OLED 模块使用注意事项)

### ◆ Precautions for Handling OLED Module (处理 OLED 模块的注意事项)

1. The display panel is made of glass and polarizer. As glass is fragile. It tends to become chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

显示屏由玻璃和偏光片组成。由于玻璃是脆弱的，使用过程中要特别防止边缘区损伤。请避免显示屏因跌落或振动而受到机械冲击。

2. Do not apply excessive force to the display surface or the adjoining areas since this may cause abnormal. Do not touch the display with bare hands. This will stain the display area (some cosmetics are determined to the polarizer).

请勿施加过大的压力于显示屏或连接部位，否则可能会引起显示异常。不要用手接触显示屏，这将弄脏显示区（一些外观是由偏光片决定的）。

3. The polarizer covering the display surface of the OLED module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.

覆盖 OLED 显示模块显示平面的偏光片是软性的且易被擦伤，请小心，轻拿。请勿用任何硬度大于 HB 铅笔芯的物品（玻璃，镊子等）接触、撞压或摩擦裸露偏光片。不要放置或粘附物体在显示区域上以免留下痕迹。冷凝在表面和端子将会损坏或弄脏偏光片。产品在低温下测试之后，与室温空气接触之前必须在容器内升温。

4. If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents.

- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

如果显示平面受污，可对平面吹热气且轻轻地用软性干布擦除。如果受污严重，用含下列一种溶剂的湿布擦除：

- 甘油
- 酒精

请勿用力擦拭以免损坏显示平面。

5. Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.

除以上提到的溶剂外，其他溶剂可能会损坏偏光片，特别要避免使用以下溶剂：

- 水
- 酮
- 芳烃溶剂

立即擦掉唾液或水滴，长时间与水接触会引起变形或褪色。避免接触油和油脂。

6. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

特别注意最小限度地减少电极腐蚀，电极腐蚀会因水滴、湿度冷凝或在高湿环境下通电而加速。

7. When mounting the OLED module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable.

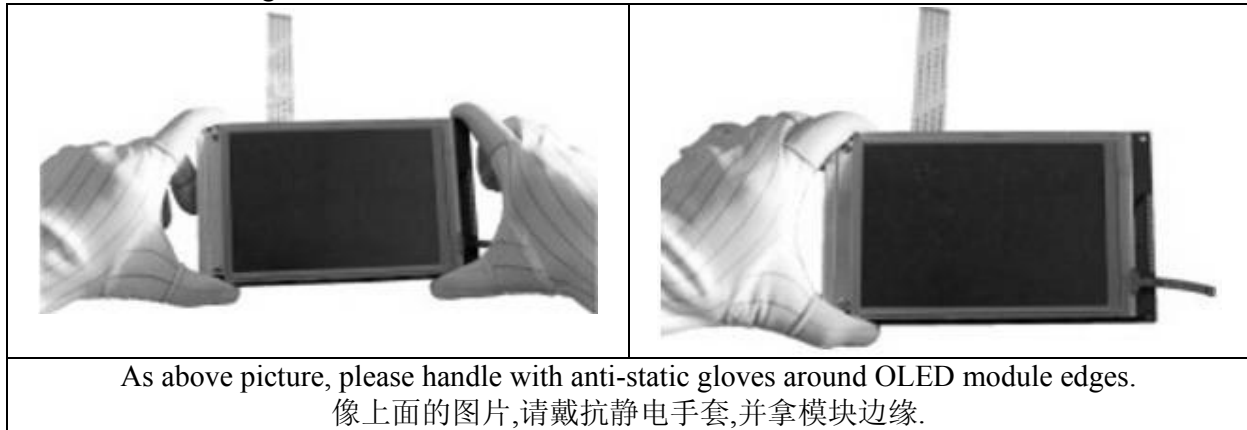
安装 OLED 模块时一定要不要弯曲、扭曲和变形。要特别注意不要用力拔，弯曲传输线。

8. Do not attempt to disassemble or process the OLED module.  
请勿拆卸 OLED 模块。
9. NC terminal should be open. Do not connect anything.  
悬空端应断开，不要连接任何器件。
10. If the logic circuit power is off, do not apply the input signals.  
如果逻辑电路电源是断开的，不要施加输入信号。
11. Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.  
由于 OLED 显示模块使用 CMOS 集成，要特别注意静电放电问题。对 CMOS 器件，要特别注意静电。为防止静电造成的损坏，注意保持合宜的工作环境。
  - Before removing OLED from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the OLED modules.  
-OLED 模块移出包装盒和安装之前，要保证模块和人体具有相同的电位。处理模块时可靠接地。
  - Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.  
- 使用工具如电烙铁，必须正确接地，并确保烙铁使用的交流电不会漏电。用电动螺丝刀固定模块时，电动螺丝刀应接地，尽可能降低电动换向器火花产生的电磁波。
  - To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.  
- 为减少静电产生，不要在干燥的条件下进行组装等工作。为降低静电，工作环境一定不要太干燥。建议相对湿度为 50%-60%。尽可能使你的工作服和工作台接地。
  - The OLED module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.  
- OLED 模块表面有保护膜。需要小心操作因为撕保护膜时可能产生静电。

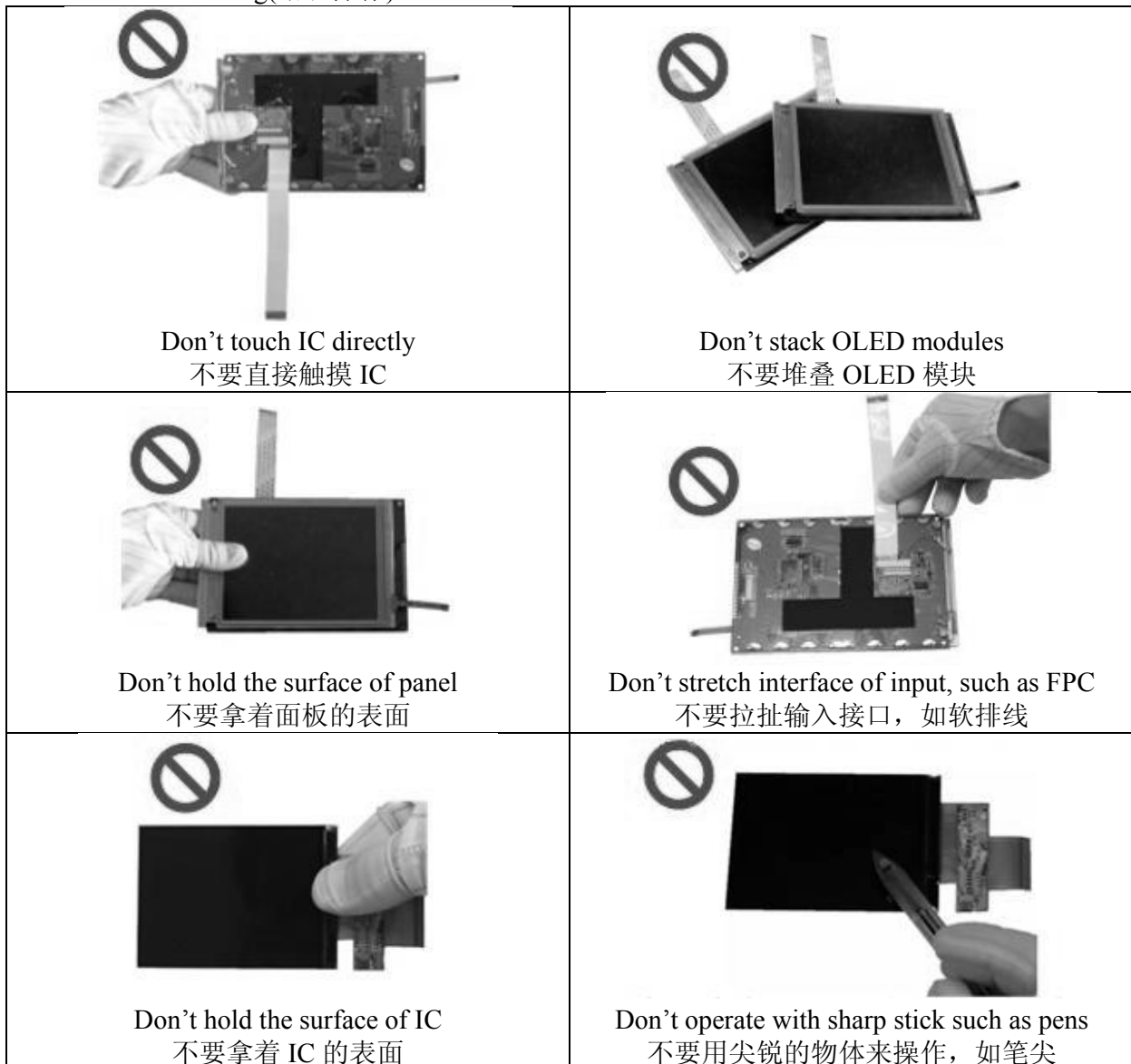
12. OLED module is easy to be damaged. Please note below and be careful for handling.

OLED 显示模块很容易被损坏. 请注意以下并小心操作

i. Correct handling (正确操作):



ii. Incorrect handling(错误操作):



**◆ Precautions for Storing OLED Module (OLED 模块存储注意事项)****1. When storing the OLED modules, the following precautions are necessary.**

OLED 模块的存储依照以下几点:

- i. Store them in a sealed polyethylene bag with the desiccant.  
使用干燥剂和聚乙烯袋密封包装。
- ii. Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.  
避光保存, 避免直接暴露在太阳光或黄光灯下, 保持温度在 0~35 摄氏度之间, 保持相对湿度在 40%RH 和 60%RH 之间。
- iii. The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped).  
偏光片表面避免接触其他物质 (建议存放在货运防静电包装中)。

**2. Others**

- i. If the OLED modules have been operating for a long time, it will cause brightness decay. It is not recommended to showing the same display patterns for a long time, otherwise the display patterns may remain on the screen as ghost images and it is unrecoverable.  
OLED 长时间点亮会有亮度衰减, 所以尽量避免长时间工作于同一个显示图案, 否则会造成鬼影, 这是不可恢复的。
- ii. To minimize the performance degradation of the OLED modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.  
为最小限度地降低由静电等导致 OLED 模块性能降低, 使用模块时慎重使用下列区域:
  - Exposed area of the printed circuit board.  
印制电路板裸露区域。
  - Terminal electrode sections.  
印制电路板引出端子区域。

# ◆ Using OLED Modules (OLED 模块使用注意事项)

## Installing OLED Modules (安装 OLED 模块)

- i. When assembling the OLED module into other equipment, the spacer to the bit between the OLED module and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be  $\pm 0.1\text{mm}$ .

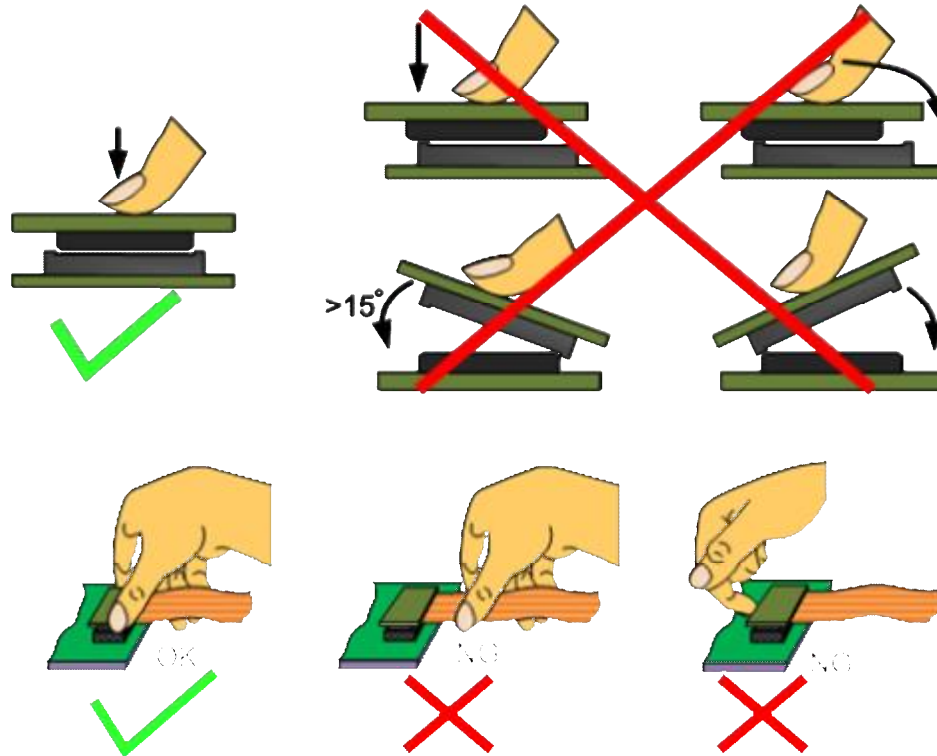
将 OLED 模块安装进入其它设备时, 模块和安装板之间间隔应有足够的高度以避免模块表面受压。参照专业度量技术标准。量度公差应是 $\pm 0.1$  毫米。

- ii. Precaution for assemble the module with BTB connector:

用板对板连接器安装 OLED 显示模块注意事项:

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows.

请注意连接器的公母及连接位置, 请勿出现下图所示的连接方式。





**◆ Precautions for Soldering OLED Module (OLED 模块焊接注意事项)**

	Manual soldering 手工焊接	Machine drag soldering 机器拖焊	Machine press soldering 机器压焊
No RoHS Product 非环保产品	290°C ~350°C. Time: 3-5S.	330°C ~350°C. Speed : 15-17 mm/s.	300°C ~330°C. Time: 3-6S. Press: 0.8~1.2Mpa
RoHS Product 环保产品	340°C ~370°C. Time: 3-5S.	350°C ~370°C. Speed : 15-17 mm/s.	330°C ~360°C. Time: 3-6S. Press: 0.8~1.2Mpa

1. If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation (This does not apply in the case of a non-halogen type of flux). It is recommended that you protect the OLED surface with a cover during soldering to prevent any damage due to flux spatters.  
如果使用助焊剂，完成焊接后一定要清除剩余的助焊剂（除非卤化物助焊剂）。建议焊接时用盖子保护显示屏面以避免因助焊剂溅出造成的任何损坏。
2. When soldering the OLED module and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.  
焊接 OLED 模块和线路板时，不应装卸多于三次。尽管焊接温度会有变化，但不应超过上面提到的焊接温度和时间最大值。
3. When remove the OLED module from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.  
从线路板上移除 OLED 模块时，要保证焊锡已完全熔化，不要损坏线路板上的焊接位。

**◆ Precautions for Operation (工作运行注意事项)**

1. OLED is a self-light device, do not use back character on a white background display mode, otherwise the power consumption will be higher and it will cause crosstalk.  
OLED 是自发光器件，不要使用白底黑字显示模式，否则功耗增大，并且会有交叉效应。
2. It is an indispensable condition to drive OLED's within the specified voltage limit since the higher voltage than the limit will damage the driver IC.  
在 OLED 驱动电压内来操作模块是必要的。超过限定电压会损坏集成电路。
3. The brightness will be lower at lower temperature than the normal temperature and will be higher at higher temperature. However those phenomena do not mean malfunction or out of order with OLED's, which will come back in the normal temperature.  
OLED 亮度在低温时比常温要暗，高温时，会比常温要高。然而,这并不是指 OLED 示屏工作异常，显示屏在恢复常温时，效果会恢复正常。
4. If the display area is pushed hard, the display will cause pixel short, it will become the display defect.  
如果在运行过程中显示区受到挤压,将可能引起像素短路，引起显示缺陷。
5. A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.  
接线端冷凝会引起电化学反应而断路。因此必须在最大的操作温度之内，湿度小于 50% 的条件下使用 OLED 模块。
6. Input logic voltage before apply analog high voltage such as OLED driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.  
开机时，先接通逻辑电压，再接通模拟高压，比如 OLED 驱动电压。关机时，先断开模拟高压，再关逻辑电压。正负电源都稳定后再送控制信号。
7. Please keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.  
模块在操作和存储规格范围内使用。高温高湿可能会引起偏振退化，起泡，偏光片脱落等问题。

**◆ Safety (安全)**

1. It is recommended to crush damaged or unnecessary OLED into pieces.  
建议将损坏的 OLED 显示屏压成碎片。
2. If any solid or powder leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.  
如果任何固体或粉末从玻璃种泄漏出且与手接触,要用肥皂和水彻底清洗。

**◆ Limited Warranty (有限质保)**

Unless agreed between TRULY and the customer, TRULY will replace or repair any of its OLED modules which are found to be functionally defective when inspected in accordance with TRULY OLED acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic/visual defects must be returned to TRULY within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of TRULY limited to repair and/or replace on the terms set forth above. TRULY will not be responsible for any subsequent or consequential events.

除信利和客户之间另有协议外，自生产之日起一年内，根据信利的OLED显示屏品质标准，信利将对有功能缺陷的OLED显示模块换货或返工。外观/视觉缺陷产品，必须在出货后90天内归还信利。以产品上标识日期为准。信利保修责任仅限于对符合上述规定的货品进行返工和/或换货。对此后发生的任何情况，信利均不承担任何责任。

**◆ Return OLED Module under Warranty (OLED 模块返修质保)**

1. No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

保修是以上述注意事项未被忽视为先决条件的。典型的违反例子如下：

- Broken OLED glass.  
-断裂的 OLED 显示屏玻璃。
- PCB eyelet is damaged or modified.  
-印制线路板孔修改或损坏。
- PCB conductors damaged.  
-线路板导体损坏。
- Circuit modified in any way, including addition of components.  
-线路随意变更，包括元件变化。
- PCB tampered with by grinding, engraving or painting varnish.  
-印制电路板已修改，如研磨，雕刻，绘涂等。
- Soldering to or modifying the bezel in any manner.  
-焊接或变动模块

2. Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

模块维修清单将按双方协议送呈客户。模块详细缺陷描述须模块一并退回。顾客安装的连接器和电缆必须在不破坏线路板孔，线路和引线端条件下全部移去。

## ■ PRIOR CONSULT MATTER (提前商议事项)

1. For Truly standard products, we keep the right to change material, process ... for improving the product property without prior notice to our customer.  
对于信利的标准产品，我们保留在不通知客户的情况下,为提高产品性能而改变原材料及加工方法等的权利。
2. For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.  
对于 OEM 产品，如果需要做任何会影响到产品性能的改变，我们会提前和客户商议。
3. If you have special requirement about reliability condition, please let us know before you start the test on our samples.  
如对可靠性条件有特殊要求，请在产品测试前通知我们。