

# OCM16096 图形点阵液晶显示模块

## 使用说明书

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**上海思先电子有限公司**

**Shanghai Sixian Electronics Co; Ltd.**

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单位名称：上海思先电子有限公司

单位地址：上海市北京东路668号赛格电子市场1B29柜、2F46室

电话：021-53083613（2F46室）；021-61209205（1B29柜）

传真：021-53083619（2F46室）；021-53085237（1B29柜）

邮编：200001

<http://www.shsixian.com>

E-mail: [sx@shsixian.com](mailto:sx@shsixian.com)

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初始化程序参考

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# 1、产品简介

主要工艺：COG  
 显示内容：160X96 点阵  
 显示模式：STN，POSITIVE  
 驱动条件：1/96Duty,1/9Bias  
 视向：6：00  
 背光：LED，白色  
 工作温度：-20℃-+70℃  
 储存温度：-30℃-+80℃  
 驱动 IC：S6B0719

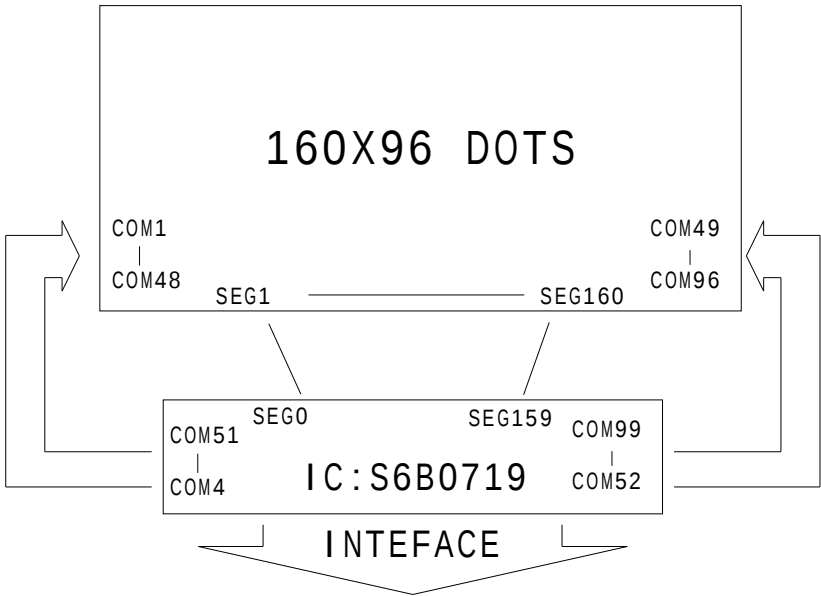
# 2、引用文件

S6B0719 规格书

# 3、机械特性

| 类别    | 标准值                         | 单位 |
|-------|-----------------------------|----|
| 模块    | 71.6 (w) X60.6(h)X9.2(t)Max | mm |
| 有效显示区 | 62.0(w)X36.0(h)             | mm |
| 点大小   | 0.35(w)X0.33(h)             | mm |
| 点间隙   | 0.02 (w)X0.02 (h)           | mm |

# 4、产品框图



# 5、光电特性

| 类别   | 符号   | 条件  | 最小值 | TYP | 最大值 | 单位  |
|------|------|-----|-----|-----|-----|-----|
| 驱动电压 | Vop. | 25℃ | 8.8 | 9.0 | 9.2 | V   |
| 响应时间 | Ton  | 25℃ | —   | 127 | 400 | Ms  |
| 对比度  | Toff | 25℃ | —   | 263 | 400 | Ms  |
|      | CR   | 25℃ | —   | 9   | —   | —   |
| 视角范围 |      | 25℃ | —   | 88  | —   | DEG |
| 交叉效应 |      | 25℃ | —   | 1.2 | —   | —   |

## 6、极限参数

| 参数   | 符号      | 最小值  | 最大值   | 单位 |
|------|---------|------|-------|----|
| 逻辑电压 | Vdd     | -0.3 | +3.3  | V  |
| 驱动电压 | Vout,VO | -0.3 | -10.8 | V  |
| 工作温度 | Top     | -20  | +70   | °C |
| 存储温度 | Tst     | -30  | +80   | °C |

## 7、接口时序

### Read / Write Characteristics (8080-series MPU)

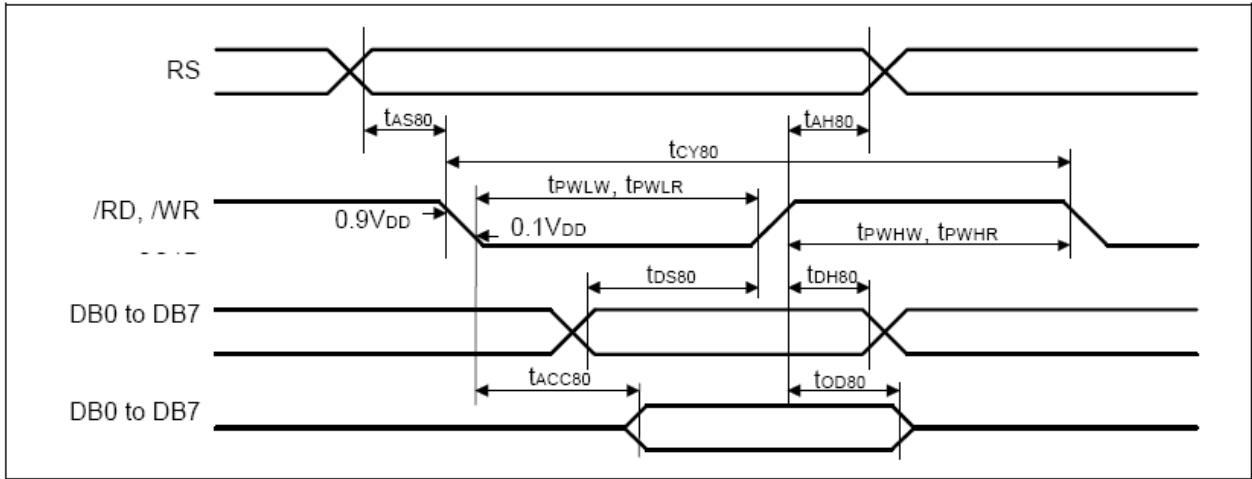


Figure 39. Parallel Interface (8080-series MPU) Timing Diagram

Table 27. AC Characteristics (8080-series Parallel Mode)

(VDD = 2.4 ~ 3.6V, Ta = -40 ~ +85°C)

| Item                       | Signal      | Symbol      | Condition   | Min. | Max. | Unit |
|----------------------------|-------------|-------------|-------------|------|------|------|
| Address setup time         | RS          | $t_{AS80}$  |             | 0    | -    | ns   |
| Address hold time          |             | $t_{AH80}$  |             | 0    | -    |      |
| System cycle time          |             | $t_{CY80}$  |             | 300  | -    | ns   |
| Pulse width low for write  | RW_WR (/WR) | $t_{PWLW}$  |             | 60   | -    | ns   |
| Pulse width High for write |             | $t_{PWHW}$  |             | 60   | -    |      |
| Pulse width low for read   | E_RD (/RD)  | $t_{PWLr}$  |             | 120  | -    | ns   |
| Pulse width high for read  |             | $t_{PWHR}$  |             | 60   | -    |      |
| Data setup time            | DB0 to DB7  | $t_{DS80}$  | CL = 100 pF | 40   | -    | ns   |
| Data hold time             |             | $t_{DH80}$  |             | 15   | -    |      |
| Read access time           |             | $t_{ACC80}$ |             | -    | 140  | ns   |
| Output disable time        |             | $t_{OD80}$  |             | 10   | 100  |      |

NOTE: \*1. The input signal rise time and fall time ( $t_r$ ,  $t_f$ ) is specified at 15 ns or less.  
 $(t_r + t_f) < (t_{CY80} - t_{PWLW} - t_{PWHW})$  for write,  $(t_r + t_f) < (t_{CY80} - t_{PWLr} - t_{PWHR})$  for read

## Read / Write Characteristics (6800-series Microprocessor)

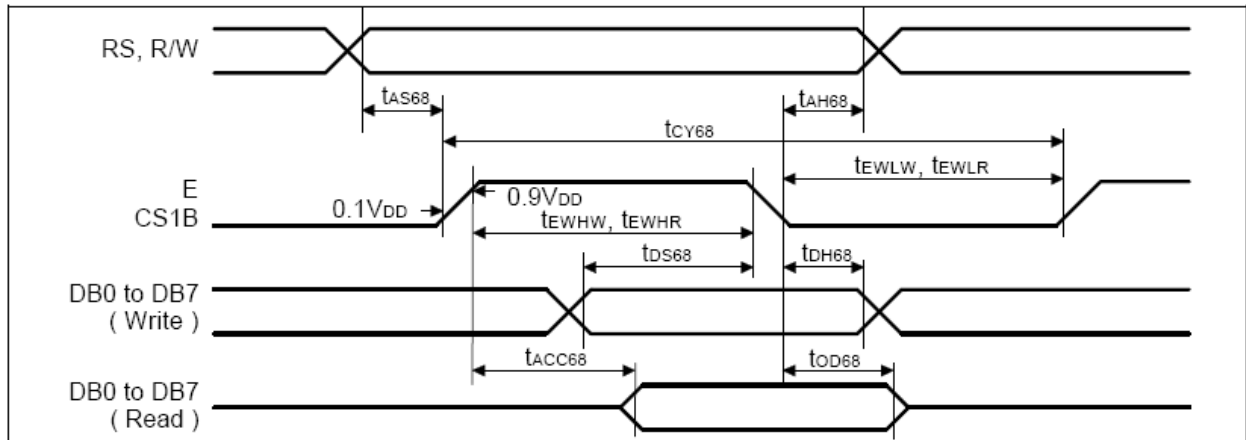


Figure 40. Parallel Interface (6800-series MPU) Timing Diagram

Table 28. AC Characteristics (6800-series Parallel Mode)

(VDD = 2.4 ~ 3.6V, Ta = -40 ~ +85°C)

| Item                        | Signal     | Symbol | Condition   | Min. | Max. | Unit |
|-----------------------------|------------|--------|-------------|------|------|------|
| Address setup time          | RS         | tAS68  |             | 0    | -    | ns   |
| Address hold time           | RW         | tAH68  |             | 0    | -    | ns   |
| System cycle time           |            | tCY68  |             | 300  | -    | ns   |
| Enable width high for write | E_RD       | tEWHW  |             | 60   | -    | ns   |
| Enable width low for write  | (E)        | tEHLW  |             | 60   | -    | ns   |
| Enable width high for read  | E_RD       | tEWHR  |             | 120  | -    | ns   |
| Enable width low for read   | (E)        | tEHLR  |             | 60   | -    | ns   |
| Data setup time             | DB0 to DB7 | tDS68  |             | 40   | -    | ns   |
| Data hold time              |            | tDH68  |             | 15   | -    | ns   |
| Read access time            | DB7        | tACC68 | CL = 100 pF | -    | 140  | ns   |
| Output disable time         |            | tOD68  |             | 10   | 100  | ns   |

NOTE: \*1. The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

(tr + tf) &lt; (tCY68 - tEWHW - tEHLW) for write, (tr + tf) &lt; (tCY68 - tEWHR - tEHLR) for read

## Serial Interface Characteristics

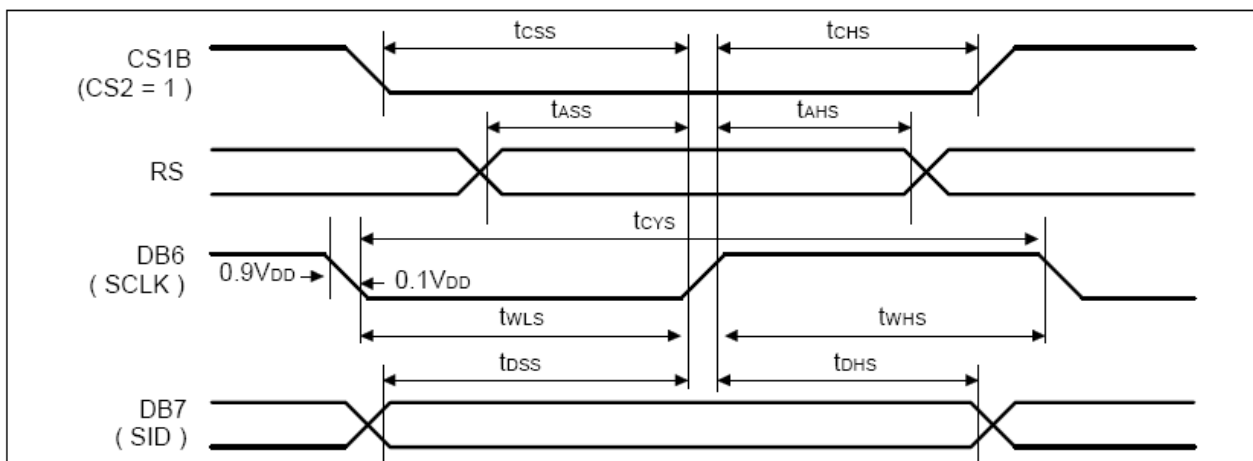


Figure 41. Serial Interface Timing Diagram

Table 29. AC Characteristics (Serial Mode)

(VDD = 2.4 ~ 3.6V, Ta = -40 ~ +85°C)

| Item                                                                | Signal        | Symbol                                                   | Condition | Min.              | Max.        | Unit |
|---------------------------------------------------------------------|---------------|----------------------------------------------------------|-----------|-------------------|-------------|------|
| Serial clock cycle<br>SCLK high pulse width<br>SCLK low pulse width | DB6<br>(SCLK) | t <sub>SCY</sub><br>t <sub>SHW</sub><br>t <sub>SLW</sub> |           | 250<br>100<br>100 | -<br>-<br>- | ns   |
| Address setup time<br>Address hold time                             | RS            | t <sub>ASS</sub><br>t <sub>AHS</sub>                     |           | 150<br>150        | -<br>-      | ns   |
| Data setup time<br>Data hold time                                   | DB7<br>(SID)  | t <sub>DSS</sub><br>t <sub>DHS</sub>                     |           | 100<br>100        | -<br>-      | ns   |
| CS1B setup time<br>CS1B hold time                                   | CS1B          | t <sub>CSS</sub><br>t <sub>CHS</sub>                     |           | 150<br>150        | -<br>-      | ns   |

## Reset Input Timing

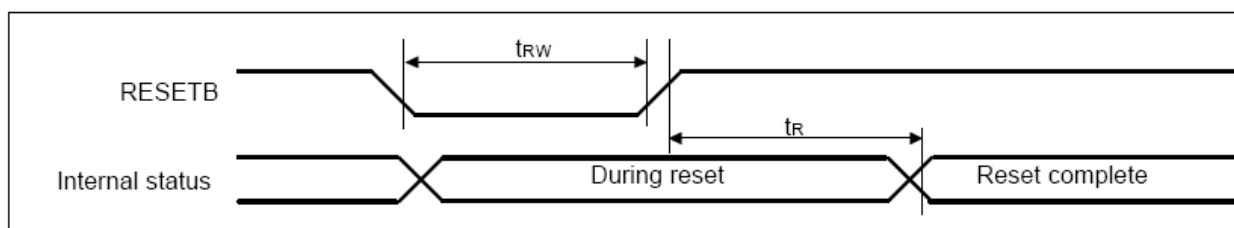


Figure 42. Reset Input Timing Diagram

Table 30. AC Characteristics (Reset mode)

(VDD = 2.4 ~ 3.6V, Ta = -40 ~ +85°C)

| Item                  | Signal | Symbol          | Condition | Min. | Max. | Unit |
|-----------------------|--------|-----------------|-----------|------|------|------|
| Reset low pulse width | RESETB | t <sub>RW</sub> |           | 1000 | -    | ns   |
| Reset time            | -      | t <sub>R</sub>  |           | -    | 1000 | ns   |

## 8、直流特性 (VDD=2.84V)

(VSS = 0V, VDD = 2.4 to 3.6V, Ta = -40~85°C)

| Item                     | Symbol          | Condition                                            | Min.                     | Typ.               | Max.               | Unit | Pin used        |
|--------------------------|-----------------|------------------------------------------------------|--------------------------|--------------------|--------------------|------|-----------------|
| Operating voltage (1)    | VDD             |                                                      | 2.4                      | -                  | 3.6                | V    | VDD *1          |
| Operating voltage (2)    | V0              |                                                      | 4.0                      | -                  | 15.0               | V    | V0, *2          |
| Input voltage            | High            | V <sub>IH</sub>                                      | 0.8V <sub>DD</sub>       | -                  | V <sub>DD</sub>    | V    | *3              |
|                          | Low             | V <sub>IL</sub>                                      | V <sub>SS</sub>          | -                  | 0.2V <sub>DD</sub> |      |                 |
| Output voltage           | High            | V <sub>OH</sub>                                      | I <sub>OH</sub> = -0.5mA | 0.8V <sub>DD</sub> | V <sub>DD</sub>    | V    | *4              |
|                          | Low             | V <sub>OL</sub>                                      | I <sub>OL</sub> = 0.5mA  | V <sub>SS</sub>    | 0.2V <sub>DD</sub> |      |                 |
| Input leakage current    | I <sub>IL</sub> | V <sub>IN</sub> = V <sub>DD</sub> Or V <sub>SS</sub> | - 1.0                    | -                  | + 1.0              | μA   | *3              |
| Output leakage current   | I <sub>OZ</sub> | V <sub>IN</sub> = V <sub>DD</sub> Or V <sub>SS</sub> | - 3.0                    | -                  | + 3.0              | μA   | *5              |
| LCD driver ON resistance | R <sub>ON</sub> | Ta = 25°C, V0 = 8V                                   | -                        | 2.0                | 3.0                | kΩ   | SEgN<br>COMn *6 |
| Frame frequency          | f <sub>FR</sub> | Ta = 25°C                                            | 70                       | 85                 | 100                | Hz   | *7<br>FR        |

| Item                                        | Symbol | Condition                                             | Min. | Typ. | Max. | Unit | Pin used |
|---------------------------------------------|--------|-------------------------------------------------------|------|------|------|------|----------|
| Voltage converter circuit output voltage    | VOUT   | ×3 / ×4 / ×5 / ×6<br>voltage conversion<br>(no-load ) | 95   | 99   | -    | %    | VOUT     |
| Voltage regulator circuit operating voltage | VOUT   |                                                       | 6.0  | -    | 17.0 | V    | VOUT     |
| Voltage follower circuit operating voltage  | V0     |                                                       | 4.0  | -    | 15.0 | V    | V0 *8    |
| Reference voltage                           | VREF   | Ta = 25°C                                             | 1.94 | 2.00 | 2.06 | V    | *9       |

(VDD = 3.0V, Ta = 25°C)

| Item                            | Symbol | Condition                      | Min. | Typ. | Max. | Unit | Pin used |
|---------------------------------|--------|--------------------------------|------|------|------|------|----------|
| Dynamic current consumption (1) | IDD1   | V0 - Vss = 7.0V, duty = 1/33   |      |      | TBD  | μA   | *10      |
|                                 |        | V0 - Vss = 10.0V, duty = 1/65  |      |      | TBD  |      |          |
|                                 |        | V0 - Vss = 13.0V, duty = 1/105 |      |      | TBD  |      |          |

(VDD = 3.0V, Ta = 25°C)

| Item                            | Symbol | Condition                      | Min. | Typ. | Max. | Unit | Pin used |
|---------------------------------|--------|--------------------------------|------|------|------|------|----------|
| Dynamic current consumption (1) | IDD1   | V0 - Vss = 7.0V, duty = 1/33   |      |      | TBD  | μA   | *10      |
|                                 |        | V0 - Vss = 10.0V, duty = 1/65  |      |      | TBD  |      |          |
|                                 |        | V0 - Vss = 13.0V, duty = 1/105 |      |      | TBD  |      |          |

(VDD = 3.0V, Ta = 25°C)

| Item                            | Symbol | Condition                                                    | Min. | Typ. | Max. | Unit          | Pin used |
|---------------------------------|--------|--------------------------------------------------------------|------|------|------|---------------|----------|
| Dynamic current consumption (2) | IDD2   | V0 - Vss = 7.0V, X3 boosting, duty = 1/33, normal mode       | -    | -    | TBD  | $\mu\text{A}$ | *10      |
|                                 |        | V0 - Vss = 7.0V, X3 boosting, duty = 1/33, high power mode   | -    | -    | TBD  |               |          |
|                                 |        | V0 - Vss = 10.0V, X4 boosting, duty = 1/65, normal mode      | -    | -    | TBD  | $\mu\text{A}$ | *10      |
|                                 |        | V0 - Vss = 10.0V, X4 boosting, duty = 1/65, high power mode  | -    | -    | TBD  |               |          |
|                                 |        | V0 - Vss = 13.0V, X5 boosting, duty = 1/105, normal mode     | -    | -    | TBD  | $\mu\text{A}$ | *10      |
|                                 |        | V0 - Vss = 13.0V, X5 boosting, duty = 1/105, high power mode | -    | -    | TBD  |               |          |

(VDD = 3.0V, Ta = 25°C)

| Item                            | Symbol | Condition                                                    | Min. | Typ. | Max. | Unit          | Pin used |
|---------------------------------|--------|--------------------------------------------------------------|------|------|------|---------------|----------|
| Dynamic current consumption (2) | IDD2   | V0 - Vss = 7.0V, X3 boosting, duty = 1/33, normal mode       | -    | -    | TBD  | $\mu\text{A}$ | *10      |
|                                 |        | V0 - Vss = 7.0V, X3 boosting, duty = 1/33, high power mode   | -    | -    | TBD  |               |          |
|                                 |        | V0 - Vss = 10.0V, X4 boosting, duty = 1/65, normal mode      | -    | -    | TBD  | $\mu\text{A}$ | *10      |
|                                 |        | V0 - Vss = 10.0V, X4 boosting, duty = 1/65, high power mode  | -    | -    | TBD  |               |          |
|                                 |        | V0 - Vss = 13.0V, X5 boosting, duty = 1/105, normal mode     | -    | -    | TBD  | $\mu\text{A}$ | *10      |
|                                 |        | V0 - Vss = 13.0V, X5 boosting, duty = 1/105, high power mode | -    | -    | TBD  |               |          |

(VDD = 3.0V, Ta = 25°C)

| Item                 | Symbol | Condition      | Min. | Typ. | Max. | Unit          | Pin used |
|----------------------|--------|----------------|------|------|------|---------------|----------|
| Sleep mode current   | IDDS1  | During sleep   | -    | -    | 2    | $\mu\text{A}$ |          |
| Standby mode current | IDDS2  | During standby | -    | -    | 10   | $\mu\text{A}$ |          |

## 9、引脚描述

接口定义：

| 引脚编号 | 引脚名称     | 方向  | 引脚功能描述                                                                    |
|------|----------|-----|---------------------------------------------------------------------------|
| 1    | VSS      | I   | 逻辑电源地 0V                                                                  |
| 2    | VDD      | I   | 逻辑电源正 3.0V                                                                |
| 3    | NC (V0)  | -   | 悬空 (LCD 调整电压)                                                             |
| 4    | RS       | I   | 数据\指令选择：高电平：DB0-DB7 为显示数据<br>低电平：DB0-DB7 为操作指令                            |
| 5    | RW/WR    | I   | 读/写控制脚：当接口定义为 6800 接口时，RW=H：读操作<br>RW=L：写操作<br>当接口定义为 8080 接口时，/WR 为写入控制脚 |
| 6    | E/RD     | I   | 当接口定义为 6800 接口时，为使能控制脚，E=H 有效<br>当接口定义为 8080 接口时，/RD 为读控制脚，低有效            |
| 7    | DB0      | I/O | 数据输入输出引脚                                                                  |
| 8    | DB1      | I/O | 数据输入输出引脚                                                                  |
| 9    | DB2      | I/O | 数据输入输出引脚                                                                  |
| 10   | DB3      | I/O | 数据输入输出引脚                                                                  |
| 11   | DB4      | I/O | 数据输入输出引脚                                                                  |
| 12   | DB5      | I/O | 数据输入输出引脚                                                                  |
| 13   | DB6      | I/O | 数据输入输出引脚                                                                  |
| 14   | DB7      | I/O | 数据输入输出引脚                                                                  |
| 15   | /CS      | I   | 片选择信号，低电平时有效                                                              |
| 16   | NC       | -   | 接口方式选择：高电平：接口定义为 6800 接口<br>低电平：接口定义为 8080 接口                             |
| 17   | /RST     | I   | 复位信号，低电平有效                                                                |
| 18   | NC (VEE) | -   | 悬空 (LCD 驱动输出)                                                             |
| 19   | LED+     | I   | 背光电源,LED+ (3.0V)                                                          |
| 20   | LED-     | I   | 背光电源,LED- (0V)                                                            |

单位名称：上海思先电子有限公司

单位地址：上海市北京东路668号赛格电子市场1B29柜、2F46室

电话：021-53083613 (2F46室)；021-61209205 (1B29柜)

传真：021-53083619 (2F46室)；021-53085237 (1B29柜)

邮编：200001

<http://www.shsixian.com>

E-mail: sx@shsixian.com

## 10、命令描述

指令表：

x: Don't care

| Instruction                       | RS | RW | DB7        | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Description                                                                          |
|-----------------------------------|----|----|------------|-----|-----|-----|-----|-----|-----|-----|--------------------------------------------------------------------------------------|
| Read display data                 | 1  | 1  | Read data  |     |     |     |     |     |     |     | Read data from DDRAM                                                                 |
| Write display data                | 1  | 0  | Write data |     |     |     |     |     |     |     | Write data into DDRAM                                                                |
| Read status                       | 0  | 1  | BUSY       | ADC | ON  | RES | 0   | 0   | 0   | 0   | Read the internal status                                                             |
| Set page address                  | 0  | 0  | 1          | 0   | 1   | 1   | P3  | P2  | P1  | P0  | Set page address                                                                     |
| Set column address MSB            | 0  | 0  | 0          | 0   | 0   | 1   | Y7  | Y6  | Y5  | Y4  | Set column address MSB                                                               |
| Set column address LSB            | 0  | 0  | 0          | 0   | 0   | 0   | Y3  | Y2  | Y1  | Y0  | Set column address LSB                                                               |
| Set modify-read                   | 0  | 0  | 1          | 1   | 1   | 0   | 0   | 0   | 0   | 0   | Set modify-read mode                                                                 |
| Reset modify-read                 | 0  | 0  | 1          | 1   | 1   | 0   | 1   | 1   | 1   | 0   | release modify-read mode                                                             |
| Display ON / OFF                  | 0  | 0  | 1          | 0   | 1   | 0   | 1   | 1   | 1   | D   | D = 0: display OFF<br>D = 1: display ON                                              |
| Set initial display line register | 0  | 0  | 0          | 1   | 0   | 0   | 0   | 0   | x   | x   | 2-byte instruction to specify the initial display line to realize vertical scrolling |
|                                   | 0  | 0  | x          | S6  | S5  | S4  | S3  | S2  | S1  | S0  |                                                                                      |
| Set initial COM0 register         | 0  | 0  | 0          | 1   | 0   | 0   | 0   | 1   | x   | x   | 2-byte instruction to specify the initial COM0 to realize window scrolling           |
|                                   | 0  | 0  | x          | C6  | C5  | C4  | C3  | C2  | C1  | C0  |                                                                                      |
| Set partial display duty ratio    | 0  | 0  | 0          | 1   | 0   | 0   | 1   | 0   | x   | x   | 2-byte instruction to set partial display duty ratio                                 |
|                                   | 0  | 0  | x          | D6  | D5  | D4  | D3  | D2  | D1  | D0  |                                                                                      |
| Set N-line inversion              | 0  | 0  | 0          | 1   | 0   | 0   | 1   | 1   | x   | x   | 2-byte instruction to set n-line inversion register                                  |
|                                   | 0  | 0  | x          | x   | x   | N4  | N3  | N2  | N1  | N0  |                                                                                      |
| Release N-line inversion          | 0  | 0  | 1          | 1   | 1   | 0   | 0   | 1   | 0   | 0   | Release N-line Inversion mode                                                        |
| Reverse display ON / OFF          | 0  | 0  | 1          | 0   | 1   | 0   | 0   | 1   | 1   | REV | REV = 0: normal display<br>REV = 1: reverse display                                  |
| Entire display ON / OFF           | 0  | 0  | 1          | 0   | 1   | 0   | 0   | 1   | 0   | EON | EON = 0: normal display<br>EON = 1: entire display ON                                |

| Instruction                    | RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Description                                                                             |
|--------------------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------------------------------------------------------------------------|
| Power control                  | 0  | 0  | 0   | 0   | 1   | 0   | 1   | VC  | VR  | VF  | Control power circuit operation                                                         |
| Select DC-DC step-up           | 0  | 0  | 0   | 1   | 1   | 0   | 0   | 1   | DC1 | DC0 | Select the step-up of the internal voltage converter                                    |
| Select regulator resistor      | 0  | 0  | 0   | 0   | 1   | 0   | 0   | R2  | R1  | R0  | Select internal resistance ratio of the regulator resistor                              |
| Set electronic volume register | 0  | 0  | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 2-byte instruction to specify the electronic volume register                            |
|                                | 0  | 0  | x   | x   | EV5 | EV4 | EV3 | EV2 | EV1 | EV0 |                                                                                         |
| Select LCD bias                | 0  | 0  | 0   | 1   | 0   | 1   | 0   | B2  | B1  | B0  | Select LCD bias                                                                         |
| SHL select                     | 0  | 0  | 1   | 1   | 0   | 0   | SHL | x   | x   | x   | COM bi-directional selection<br>SHL = 0: normal direction<br>SHL = 1: reverse direction |
| ADC select                     | 0  | 0  | 1   | 0   | 1   | 0   | 0   | 0   | 0   | ADC | SEG bi-directional selection<br>ADC = 0: normal direction<br>ADC = 1: reverse direction |
| Set static indicator mode      | 0  | 0  | 1   | 0   | 1   | 0   | 1   | 1   | 0   | SM  | 2-byte instruction to specify the static indicator mode                                 |
| Set static indicator register  | 0  | 0  | x   | x   | x   | x   | x   | x   | S1  | S0  |                                                                                         |
| Oscillator ON start            | 0  | 0  | 1   | 0   | 1   | 0   | 1   | 0   | 1   | 1   | Start the built-in oscillator                                                           |
| Set power save mode            | 0  | 0  | 1   | 0   | 1   | 0   | 1   | 0   | 0   | P   | P = 0: standby mode<br>P = 1: sleep mode                                                |
| Release power save mode        | 0  | 0  | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 1   | Release power save mode                                                                 |
| Reset                          | 0  | 0  | 1   | 1   | 1   | 0   | 0   | 0   | 1   | 0   | Initialize the internal functions                                                       |
| NOP                            | 0  | 0  | 1   | 1   | 1   | 0   | 0   | 0   | 1   | 1   | <u>No operation</u>                                                                     |
| Test instruction               | 0  | 0  | 1   | 1   | 1   | 1   | x   | x   | x   | x   | <u>Don't use this instruction.</u>                                                      |

## 指令介绍:

### Read Display Data

8-bit data from Display Data RAM specified by the column address and page address can be read by this instruction. As the column address is incremented by 1 automatically after each this instruction, the microprocessor can continuously read data from the addressed page. A dummy read is required after loading an address into the column address register. Display data cannot be read through the serial interface.

| RS | RW | DB7       | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----------|-----|-----|-----|-----|-----|-----|-----|
| 1  | 1  | Read data |     |     |     |     |     |     |     |

### Write Display Data

8-bit data of display data from the microprocessor can be written to the RAM location specified by the column address and page address. The column address is incremented by 1 automatically so that the microprocessor can continuously write data to the addressed page.

| RS | RW | DB7        | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|------------|-----|-----|-----|-----|-----|-----|-----|
| 1  | 0  | Write data |     |     |     |     |     |     |     |

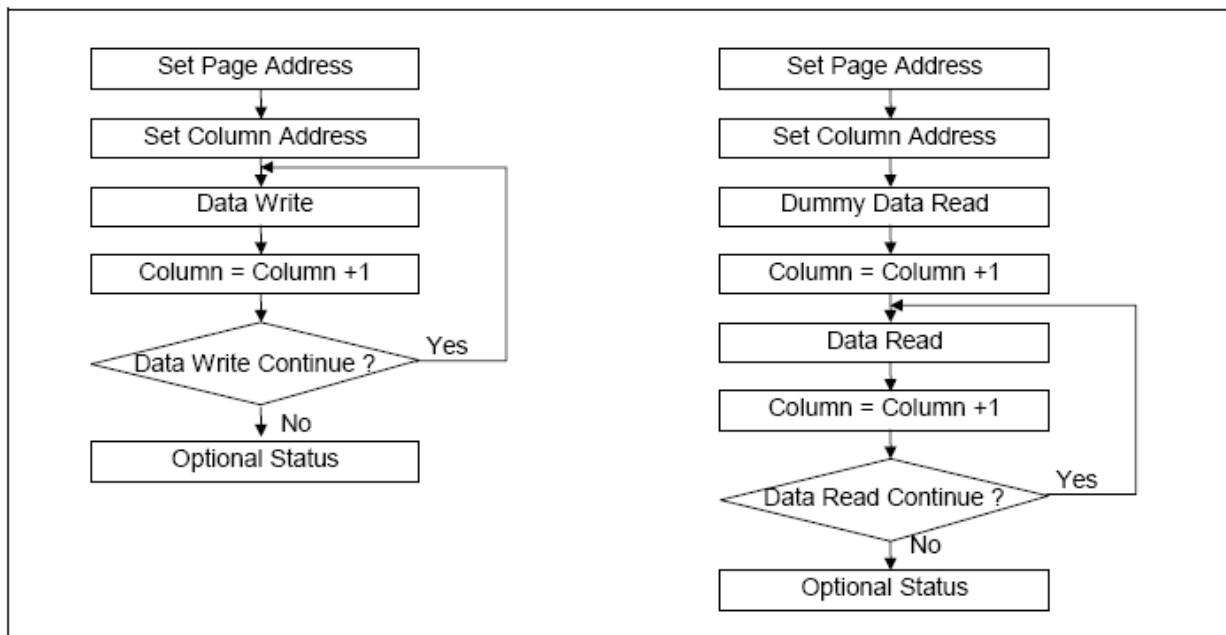


Figure 25. Sequence for Writing Display Data

Figure 26. Sequence for Reading Display Data

### Read Status

Indicates the internal status of the S6B0719

| RS | RW | DB7  | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|------|-----|-----|-----|-----|-----|-----|-----|
| 0  | 1  | BUSY | ADC | ON  | RES | 0   | 0   | 0   | 0   |

| Flag | Description                                                                                                                                            |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| BUSY | The device is busy when internal operation or reset<br>Any instruction is rejected until BUSY goes Low.<br>0: chip is active, 1: chip is being busy.   |
| ADC  | Indicates the relationship between RAM column address and segment driver.<br>0: reverse direction (SEG159 → SEG0), 1: normal direction (SEG0 → SEG159) |
| ON   | Indicates display ON / OFF status<br>0: display ON, 1: display OFF                                                                                     |
| RES  | Indicates the initialization is in progress by RESETB signal<br>0: chip is active, 1: chip is being reset.                                             |

#### Set Page Address

Sets the Page Address of display data RAM from the microprocessor into the Page Address register. Any RAM data bit can be accessed when its Page Address and column address are specified. Along with the column address, the Page Address defines the address of the display RAM to write or read display data. Changing the Page Address doesn't effect to the display status.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 1   | 1   | P3  | P2  | P1  | P0  |

| P3 | P2 | P1 | P0 | Selected page | Description                                             |
|----|----|----|----|---------------|---------------------------------------------------------|
| 0  | 0  | 0  | 0  | 0             | Accessible pages for displaying dot-matrix display data |
| 0  | 0  | 0  | 1  | 1             |                                                         |
| 0  | 0  | 1  | 0  | 2             |                                                         |
| :  | :  | :  | :  | :             |                                                         |
| 1  | 0  | 0  | 1  | 10            |                                                         |
| 1  | 0  | 1  | 0  | 11            |                                                         |
| 1  | 0  | 1  | 1  | 12            |                                                         |
| 1  | 1  | 0  | 0  | 13            | Accessible page for displaying icons                    |
| 1  | 1  | 0  | 1  | 14            | Not accessible page.<br>Do not use these pages.         |
| 1  | 1  | 1  | 0  | 15            |                                                         |

#### Set Modify-Read

This instruction stops the automatic increment of the column address by the read display data instruction, but the column address is still increased by the write display data instruction. And it reduces the load of microprocessor when the data of a specific area is repeatedly changed during cursor blinking or others. This mode is canceled by the reset Modify-read instruction.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   |

#### Reset Modify-Read

This instruction cancels the Modify-read mode, and makes the column address return to its initial value just before the set Modify-read instruction is started.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 1   | 0   | 1   | 1   | 1   | 0   |

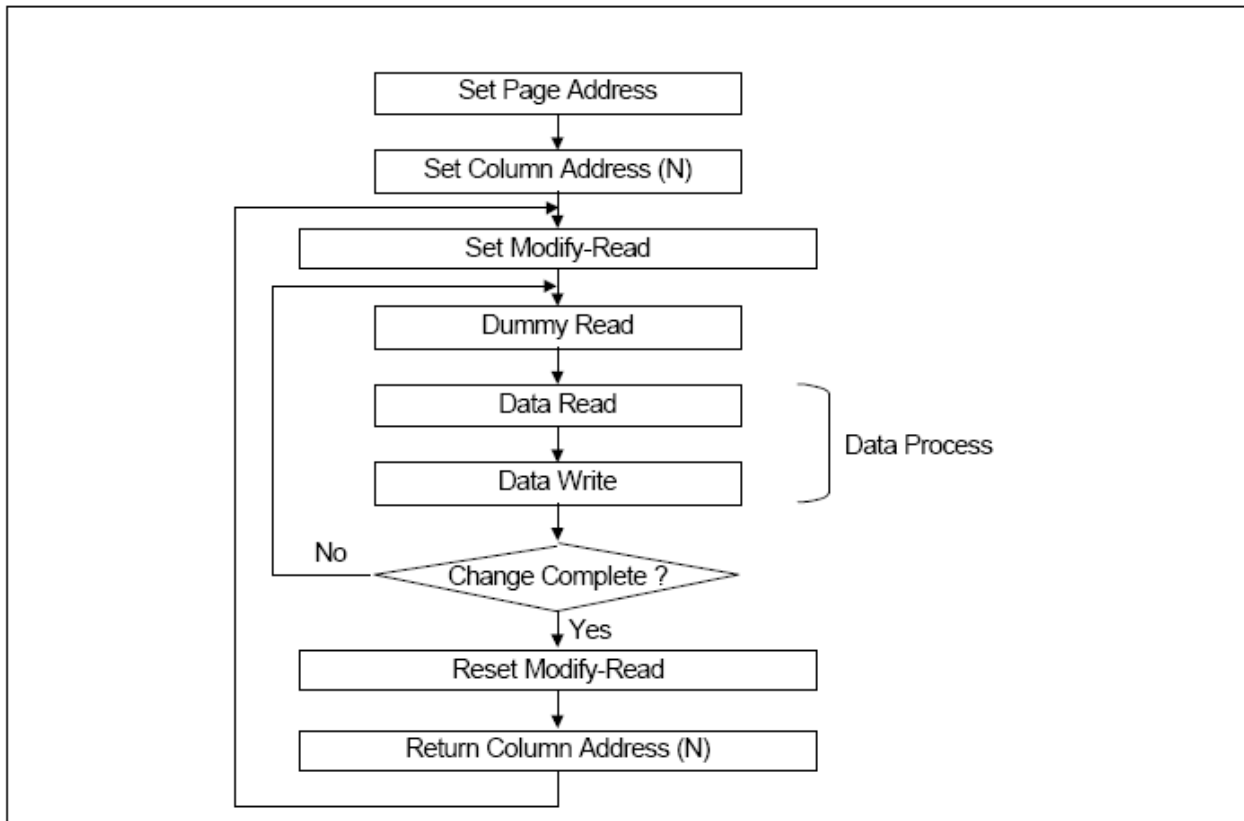


Figure 27. Sequence for Cursor Display

**The 2<sup>nd</sup> Instruction**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | ×   | S6  | S5  | S4  | S3  | S2  | S1  | S0  |

**Display ON / OFF**

Turns the Display ON or OFF

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 1   | 0   | 1   | 1   | 1   | D   |

D = 1: display ON  
D = 0: display OFF

**Set Initial Display Line Register**

Sets the line address of display RAM to determine the initial display line using 2-byte instruction. The RAM display data is displayed at the top row (COM0) of LCD panel.

**The 1<sup>st</sup> Instruction**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 0   | 1   | 0   | 0   | 0   | 0   | ×   | ×   |

**The 2<sup>nd</sup> Instruction**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | ×   | S6  | S5  | S4  | S3  | S2  | S1  | S0  |

| S6 | S5 | S4 | S3 | S2 | S1 | S0 | Selected line address |
|----|----|----|----|----|----|----|-----------------------|
| 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0                     |
| 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1                     |
| :  | :  | :  | :  | :  | :  | :  | :                     |
| 1  | 1  | 0  | 0  | 1  | 1  | 0  | 102                   |
| 1  | 1  | 0  | 0  | 1  | 1  | 1  | 103                   |
| 1  | 1  | 0  | 1  | 0  | 0  | 0  | No operation          |
| :  | :  | :  | :  | :  | :  | :  |                       |
| 1  | 1  | 1  | 1  | 1  | 1  | 1  |                       |

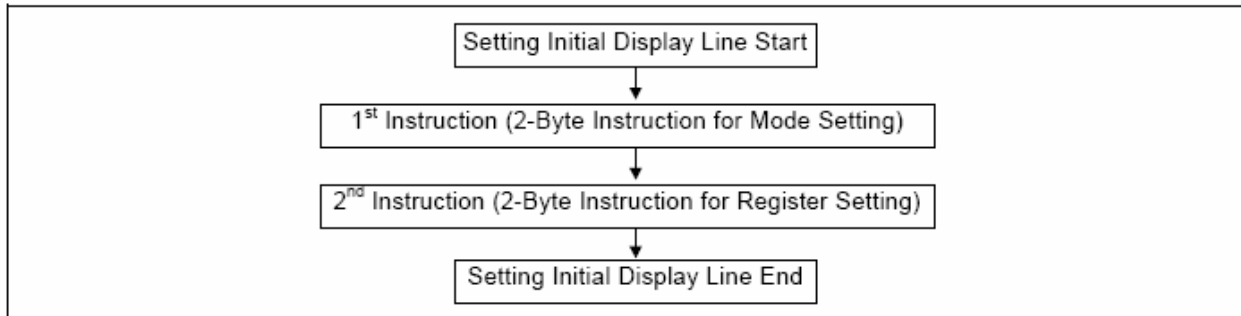


Figure 28. The Sequence for Setting the Initial Display Line

**Set Initial COM0 Register**

Sets the initial row (COM) of the LCD panel using the 2-byte instruction. By using this instruction, it is possible to realize the window moving without the change of display data.

**The 1<sup>st</sup> Instruction**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 0   | 1   | 0   | 0   | 0   | 1   | ×   | ×   |

**The 2<sup>nd</sup> Instruction**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | ×   | C6  | C5  | C4  | C3  | C2  | C1  | C0  |

| C6 | C5 | C4 | C3 | C2 | C1 | C0 | Initial COM0 |
|----|----|----|----|----|----|----|--------------|
| 0  | 0  | 0  | 0  | 0  | 0  | 0  | COM0         |
| 0  | 0  | 0  | 0  | 0  | 0  | 1  | COM1         |
| 0  | 0  | 0  | 0  | 0  | 1  | 0  | COM2         |
| :  | :  | :  | :  | :  | :  | :  | :            |
| 1  | 1  | 0  | 0  | 1  | 0  | 1  | COM101       |
| 1  | 1  | 0  | 0  | 1  | 1  | 0  | COM102       |
| 1  | 1  | 0  | 0  | 1  | 1  | 1  | COM103       |
| 1  | 1  | 0  | 1  | 0  | 0  | 0  | No operation |
| :  | :  | :  | :  | :  | :  | :  |              |
| 1  | 1  | 1  | 1  | 1  | 1  | 1  |              |

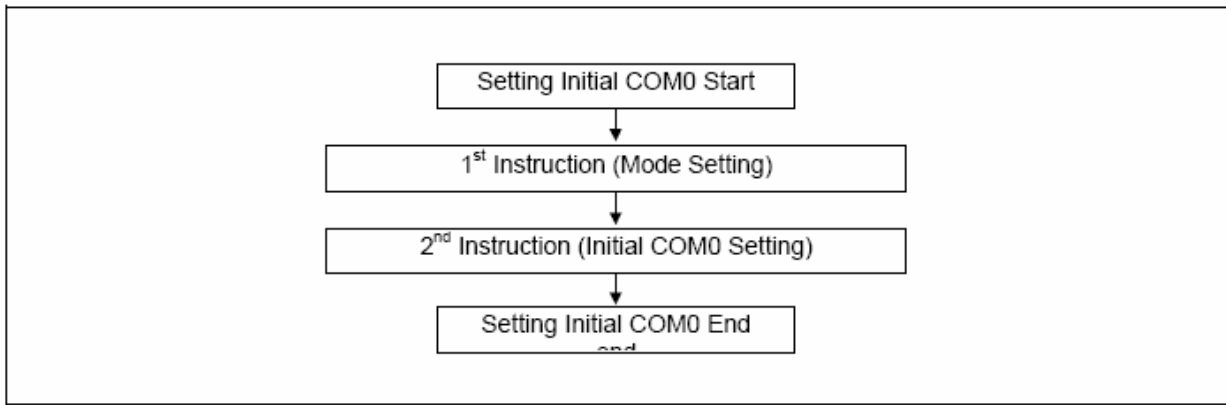


Figure 29. Sequence for Setting the Initial COM0

**Set Partial Display Duty Ratio**

Sets the duty ratio within range of 9, 17 and 32 to 105 to realize Partial Display by using the 2-byte instruction.

**The 1<sup>st</sup> Instruction**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 0   | 1   | 0   | 0   | 1   | 0   | ×   | ×   |

**The 2<sup>nd</sup> Instruction**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | ×   | D6  | D5  | D4  | D3  | D2  | D1  | D0  |

| D6                 | D5 | D4 | D3 | D2 | D1 | D0 | Selected partial duty ratio |
|--------------------|----|----|----|----|----|----|-----------------------------|
| 0                  | 0  | 0  | 1  | 0  | 0  | 1  | 1/9                         |
| 0                  | 0  | 1  | 0  | 0  | 0  | 1  | 1/17                        |
| 0                  | 1  | 0  | 0  | 0  | 0  | 0  | 1/32                        |
| 0                  | 1  | 0  | 0  | 0  | 0  | 1  | 1/33                        |
| ⋮                  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮                           |
| 1                  | 0  | 1  | 0  | 1  | 0  | 0  | 1/104                       |
| 1                  | 0  | 1  | 0  | 1  | 0  | 1  | 1/105                       |
| Other combinations |    |    |    |    |    |    | No operation                |

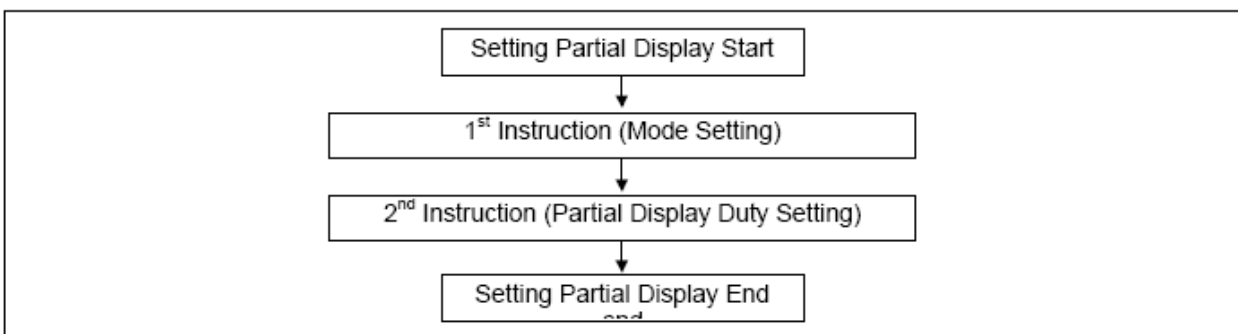


Figure 30. Sequence for Setting Partial Display

### Set N-line Inversion Register

Sets the inverted line number within range of 2 to 32 to improve the display quality by controlling the phase of the internal LCD AC signal (M) by using the 2-byte instruction.

#### The 1<sup>st</sup> Instruction

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 0   | 1   | 0   | 0   | 1   | 1   | ×   | ×   |

#### The 2<sup>nd</sup> Instruction

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | ×   | ×   | ×   | N4  | N3  | N2  | N1  | N0  |

| N4 | N3 | N2 | N1 | N0 | Selected n-line inversion          |
|----|----|----|----|----|------------------------------------|
| 0  | 0  | 0  | 0  | 0  | 0-line inversion (frame inversion) |
| 0  | 0  | 0  | 0  | 1  | 2-line inversion                   |
| 0  | 0  | 0  | 1  | 0  | 3-line inversion                   |
| 0  | 0  | 0  | 1  | 1  | 4-line inversion                   |
| ⋮  | ⋮  | ⋮  | ⋮  | ⋮  | ⋮                                  |
| 1  | 1  | 1  | 0  | 1  | 30-line inversion                  |
| 1  | 1  | 1  | 1  | 0  | 31-line inversion                  |
| 1  | 1  | 1  | 1  | 1  | 32-line inversion                  |

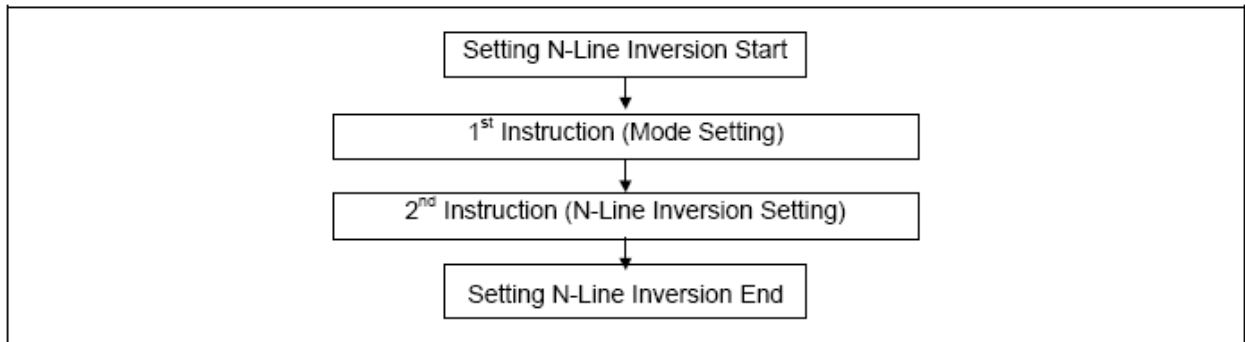


Figure 31. Sequence for Setting Partial Display

### Release N-line Inversion

Returns to the frame inversion condition from the n-line inversion condition.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 1   | 0   | 0   | 1   | 0   | 0   |

### Reverse Display ON / OFF

Reverses the display status on LCD panel without rewriting the contents of the display data RAM.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 1   | 0   | 0   | 1   | 1   | REV |

| REV         | RAM bit data = "1"           | RAM bit data = "0"           |
|-------------|------------------------------|------------------------------|
| 0 (normal)  | LCD pixel is illuminated     | LCD pixel is not illuminated |
| 1 (reverse) | LCD pixel is not illuminated | LCD pixel is illuminated     |

**Entire Display ON / OFF**

Forces the whole LCD points to be turned on regardless of the contents of the display data RAM. At this time, the contents of the display data RAM are held. This instruction has priority over the reverse Display ON / OFF instruction.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 1   | 0   | 0   | 1   | 0   | EON |

| EON        | RAM bit data = "1"       | RAM bit data = "0"           |
|------------|--------------------------|------------------------------|
| 0 (Normal) | LCD pixel is illuminated | LCD pixel is not illuminated |
| 1 (Entire) | LCD pixel is illuminated | LCD pixel is illuminated     |

**Power Control**

Selects one of eight power circuit functions by using 3-bit register. An external power supply and part of internal power supply functions can be used simultaneously.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 0   | 0   | 1   | 0   | 1   | VC  | VR  | VF  |

| VC | VR | VF | Status of internal power supply circuits  |
|----|----|----|-------------------------------------------|
| 0  |    |    | Internal voltage converter circuit is OFF |
| 1  |    |    | Internal voltage converter circuit is ON  |
|    | 0  |    | Internal voltage regulator circuit is OFF |
|    | 1  |    | Internal voltage regulator circuit is ON  |
|    |    | 0  | Internal voltage follower circuit is OFF  |
|    |    | 1  | Internal voltage follower circuit is ON   |

**Select DC/DC Step-up**

Selects one of 4 DC/DC step-up to reduce the power consumption by this instruction. It is very useful to realize the partial display function.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 0   | 1   | 1   | 0   | 0   | 1   | DC1 | DC0 |

| DC1 | DC0 | Selected DC-DC converter circuit |
|-----|-----|----------------------------------|
| 0   | 0   | 3 times boosting circuit         |
| 0   | 1   | 4 times boosting circuit         |
| 1   | 0   | 5 times boosting circuit         |
| 1   | 1   | 6 times boosting circuit         |

**Regulator Resistor Select**

Selects resistance ratio of the internal resistor used in the internal voltage regulator. See voltage regulator section in power supply circuit. Refer to the table 15.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 0   | 0   | 1   | 0   | 0   | R2  | R1  | R0  |

| R2 | R1 | R0 | [Rb / Ra] ratio |
|----|----|----|-----------------|
| 0  | 0  | 0  | Small           |
| 0  | 0  | 1  | :               |
| :  | :  | :  | :               |
| 1  | 1  | 0  | :               |
| 1  | 1  | 1  | Large           |

### Set Electronic Volume Register

Consists of 2-byte instruction. The 1<sup>st</sup> instruction sets Electronic Volume mode, the 2<sup>nd</sup> one updates the contents of Electronic Volume register. After second instruction, Electronic Volume mode is released.

#### The 1<sup>st</sup> Instruction

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 1   |

#### The 2<sup>nd</sup> Instruction

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | x   | x   | EV5 | EV4 | EV3 | EV2 | EV1 | EV0 |

| EV5 | EV4 | EV3 | EV2 | EV1 | EV0 | Reference voltage ( $\alpha$ ) |
|-----|-----|-----|-----|-----|-----|--------------------------------|
| 0   | 0   | 0   | 0   | 0   | 0   | 0                              |
| 0   | 0   | 0   | 0   | 0   | 1   | 1                              |
| :   | :   | :   | :   | :   | :   | :                              |
| 1   | 1   | 1   | 1   | 1   | 0   | 62                             |
| 1   | 1   | 1   | 1   | 1   | 1   | 63                             |

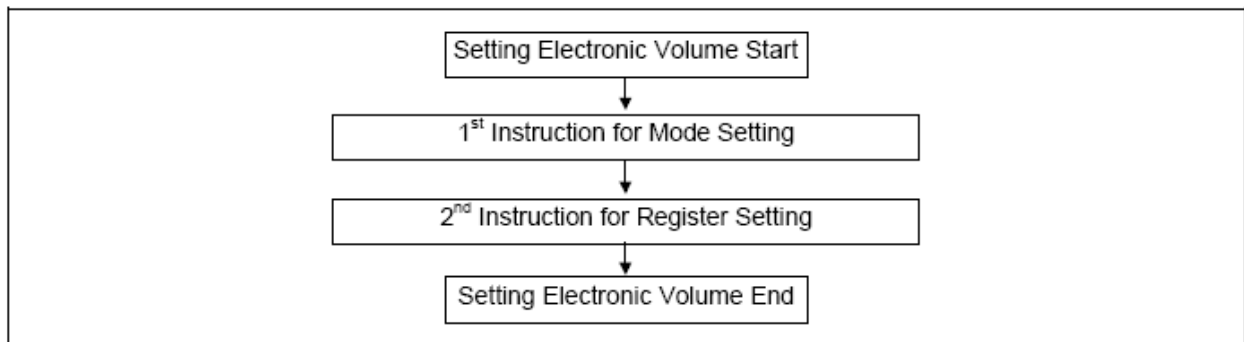


Figure 32. Sequence for Setting the Electronic Volume

**Select LCD Bias**

Selects LCD Bias ratio of the voltage required for driving the LCD.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 0   | 1   | 0   | 1   | 0   | B2  | B1  | B0  |

| B2 | B1 | B0 | Selected LCD bias |
|----|----|----|-------------------|
| 0  | 0  | 0  | 1/4               |
| 0  | 0  | 1  | 1/5               |
| 0  | 1  | 0  | 1/6               |
| 0  | 1  | 1  | 1/7               |
| 1  | 0  | 0  | 1/8               |
| 1  | 0  | 1  | 1/9               |
| 1  | 1  | 0  | 1/10              |
| 1  | 1  | 1  | 1/11              |

**SHL Select**

COM output scanning direction is selected by this instruction which determines the LCD driver output status.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 0   | 0   | SHL | ×   | ×   | ×   |

SHL = 0: normal direction (COM0 → COM103)

SHL = 1: reverse direction (COM103 → COM0)

**SHL Select**

COM output scanning direction is selected by this instruction which determines the LCD driver output status.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 0   | 0   | SHL | ×   | ×   | ×   |

SHL = 0: normal direction (COM0 → COM103)

SHL = 1: reverse direction (COM103 → COM0)

**ADC Select**

Changes the relationship between RAM column address and segment driver. The direction of segment driver output pins can be reversed by software. This makes IC layout flexible in LCD module assembly.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 1   | 0   | 0   | 0   | 0   | ADC |

ADC = 0: normal direction (SEG0 → SEG159)

ADC = 1: reverse direction (SEG159 → SEG0)

**Set Static Indicator State**

Consists of two bytes instruction. The first byte instruction (set Static Indicator mode) enables the second byte instruction (set Static Indicator register) to be valid. The first byte sets the Static Indicator ON / OFF. When it is on, the second byte updates the contents of Static Indicator register without issuing any other instruction and this Static Indicator state is released after setting the data of indicator register.

**The 1<sup>st</sup> Instruction: Set Static Indicator Mode (ON / OFF)**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 1   | 0   | 1   | 1   | 0   | SM  |

SM = 0: static indicator OFF

SM = 1: static indicator ON

**The 2<sup>nd</sup> Instruction: Set Static Indicator Register**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | ×   | ×   | ×   | ×   | ×   | ×   | S1  | S0  |

| S1 | S0 | Status of static indicator output |
|----|----|-----------------------------------|
| 0  | 0  | OFF                               |
| 0  | 1  | ON (about 0.5 second blinking)    |
| 1  | 0  | ON (about 1 second blinking )     |
| 1  | 1  | ON (always ON)                    |

**Oscillator ON Start**

This instruction enables the built-in oscillator circuit.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 1   | 0   | 1   | 0   | 1   | 1   |

**Reset**

This instruction resets initial display line, column address, page address, and common output status select to their initial status, but dose not affect the contents of display data RAM. This instruction cannot initialize the LCD power supply that is initialized by the RESETB pin.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 1   | 0   | 0   | 0   | 1   | 0   |

**Power Save**

The S6B0719 enters the Power Save status to reduce the power consumption to the static power consumption value and returns to the normal operation status by the following instructions.

**Set Power Save Mode**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 0   | 1   | 0   | 1   | 0   | 0   | P   |

P = 0: standby mode

P = 1: sleep mode

**Release Power Save Mode**

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 1   |

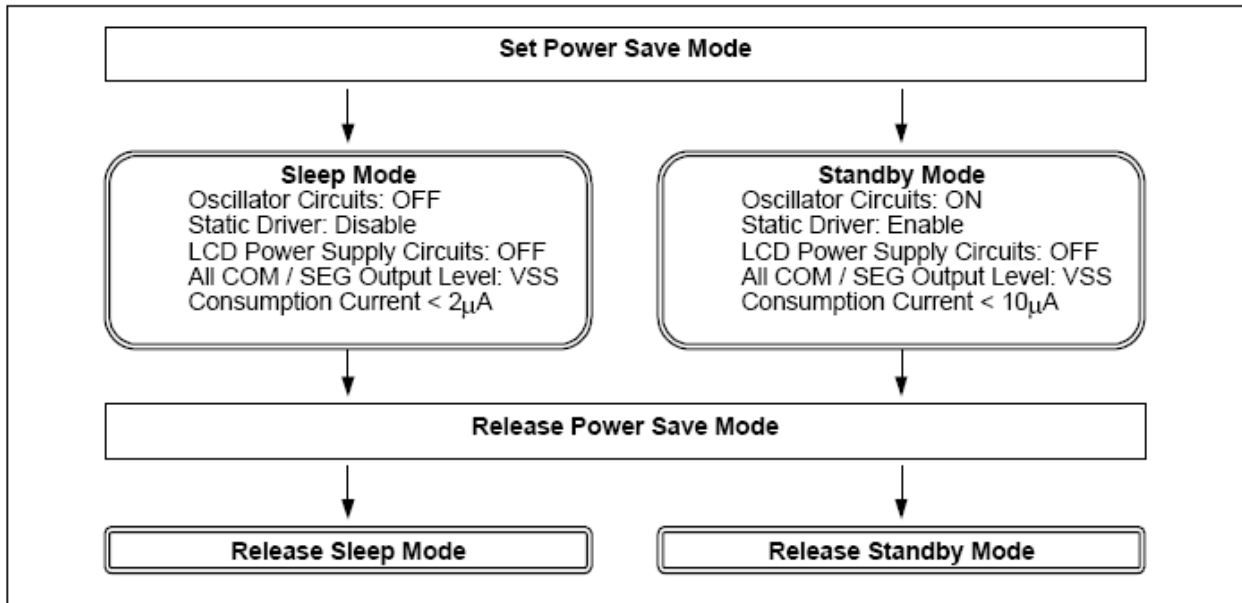


Figure 33. Power Save Routine

**NOP**

Non-operation

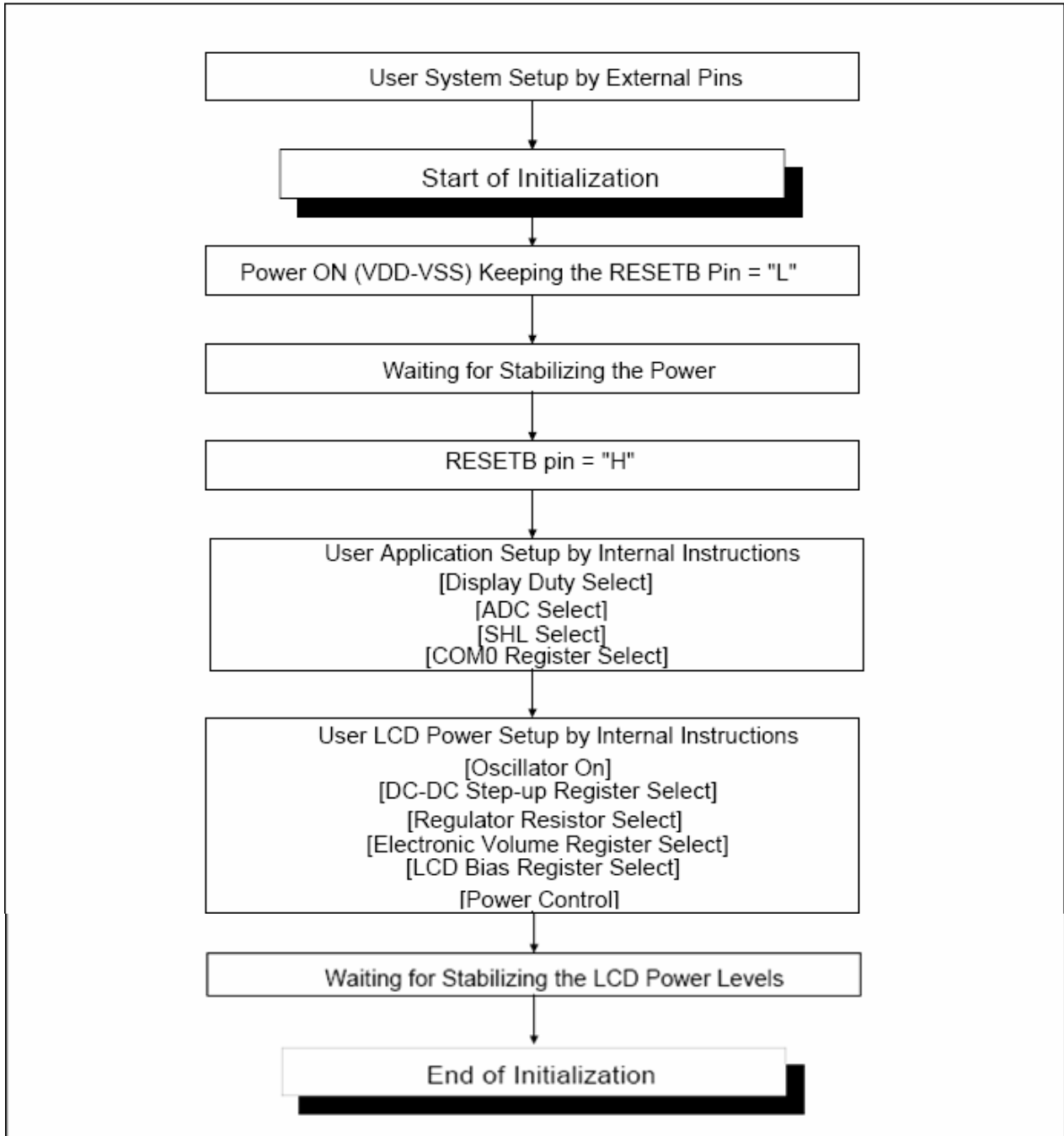
| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 1   | 0   | 0   | 0   | 1   | 1   |

**Test Instruction**

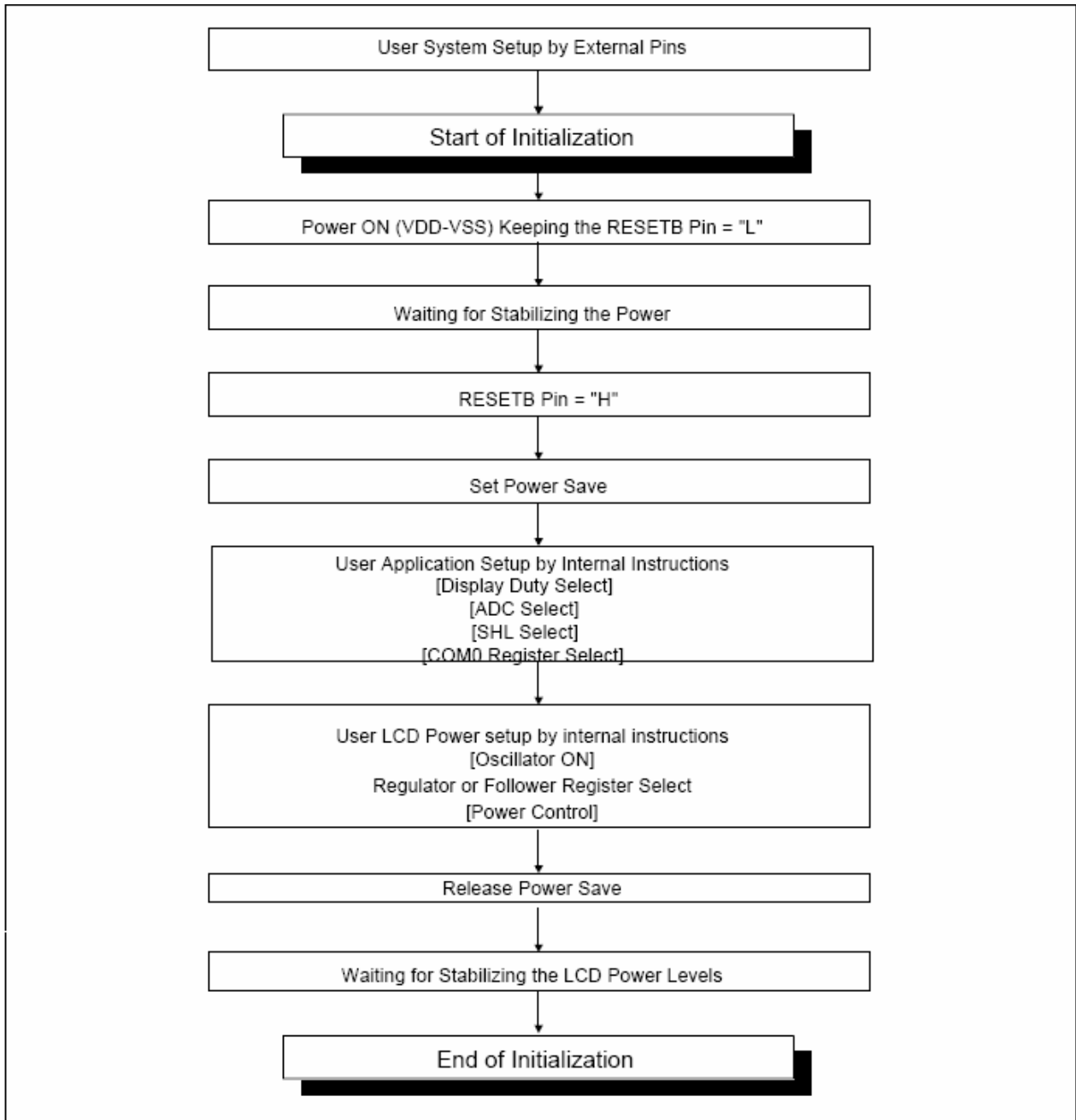
This instruction is for testing IC. Please do not use it.

| RS | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0  | 1   | 1   | 1   | 1   | ×   | ×   | ×   | ×   |

### Referential Instruction Setup Flow: Initializing with the Built-in Power Supply Circuits



### Referential Instruction Setup Flow: Initializing without the Built-in Power Supply Circuits



## Referential Instruction Setup Flow: Data Displaying

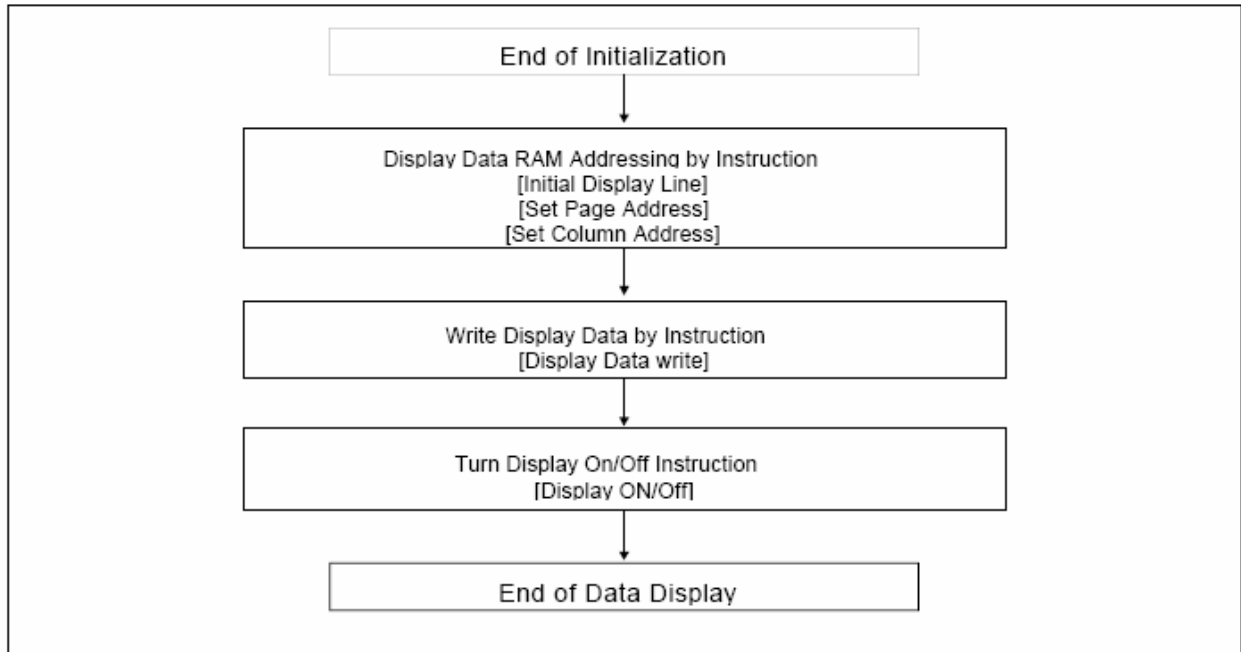


Figure 36. Data Displaying

## Referential Instruction Setup Flow: Power OFF

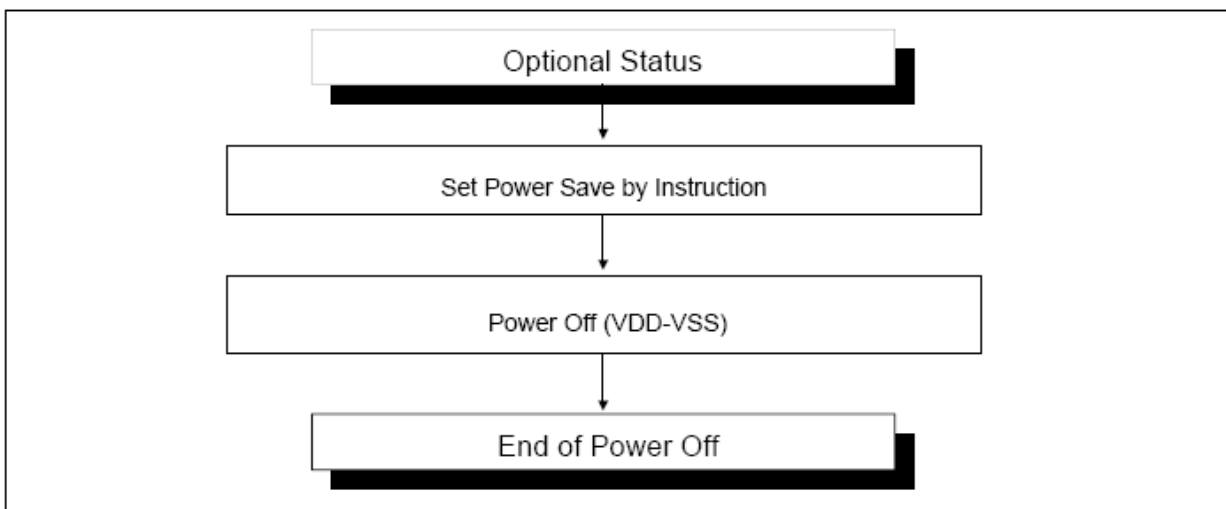
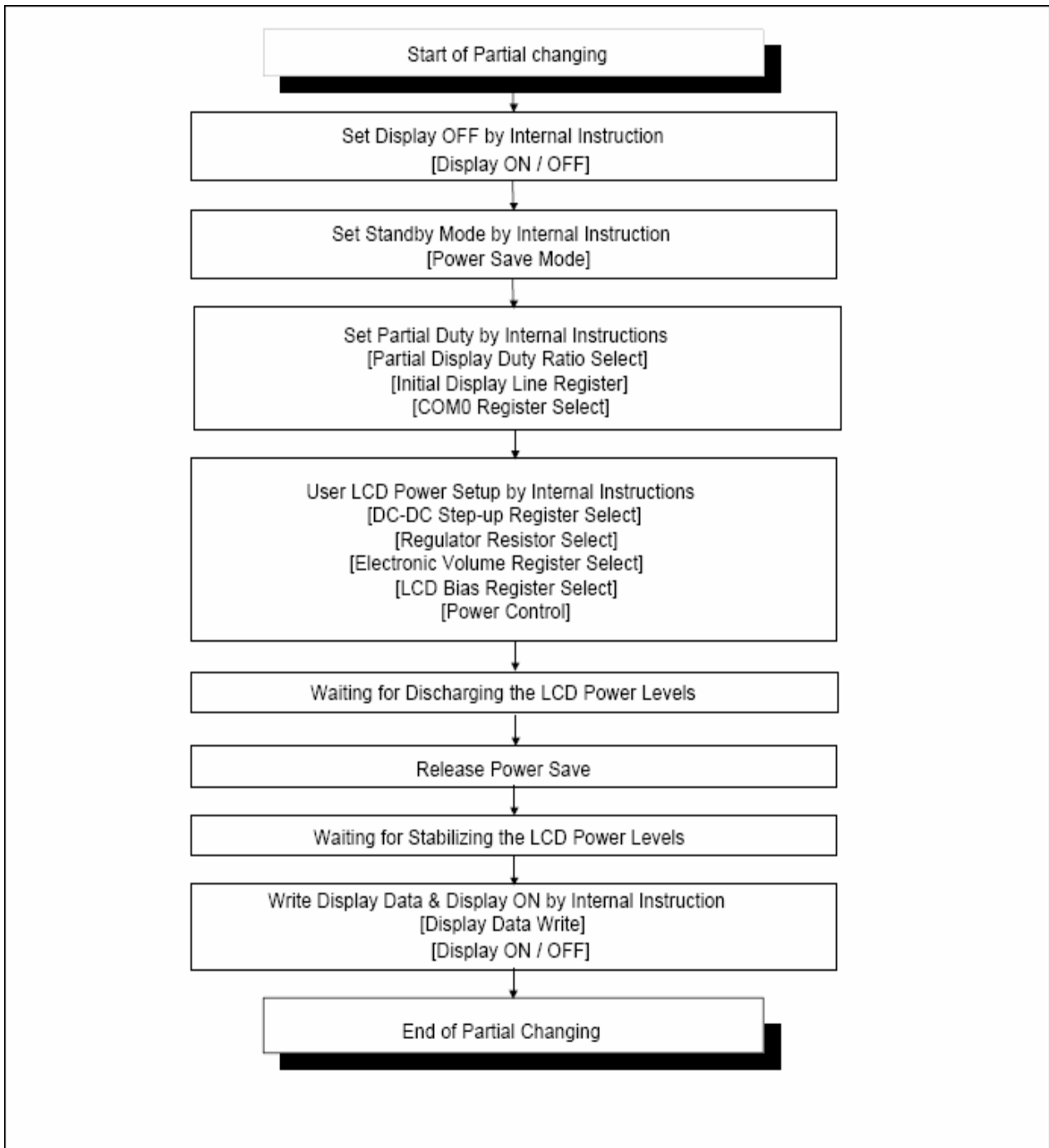


Figure 37. Power OFF

### Referential Instruction Setup Flow: Partial Duty Changing



## 11、附录

### 初始化程序参考:

//忙检测

```
void check_busy(void)
{
    uchar read_data=0xff;
    data_bus=0xff;
    LCD_RS=0;
    LCD_RW=1;           //读命令
    LCD_CS1=0;          //片使能
    while((read_data&0x80)!=0x80)
    {
        LCD_E=1;
        _nop_();
        _nop_();
        read_data=data_bus;
        LCD_E=0;
    }
    LCD_E=0;
    LCD_CS1=1;          //片禁能
}
```

//写命令到寄存器

```
void send_cmd(uchar cmd) small
{
    check_busy();
    LCD_RS=0;
    LCD_RW=0;           //写命令
    LCD_CS1=0;          //片使能
    data_bus=cmd;
    LCD_E=1;
    _nop_();
    _nop_();
    LCD_E=0;
    _nop_();
    _nop_();
    LCD_CS1=1;          //片禁能
}
```

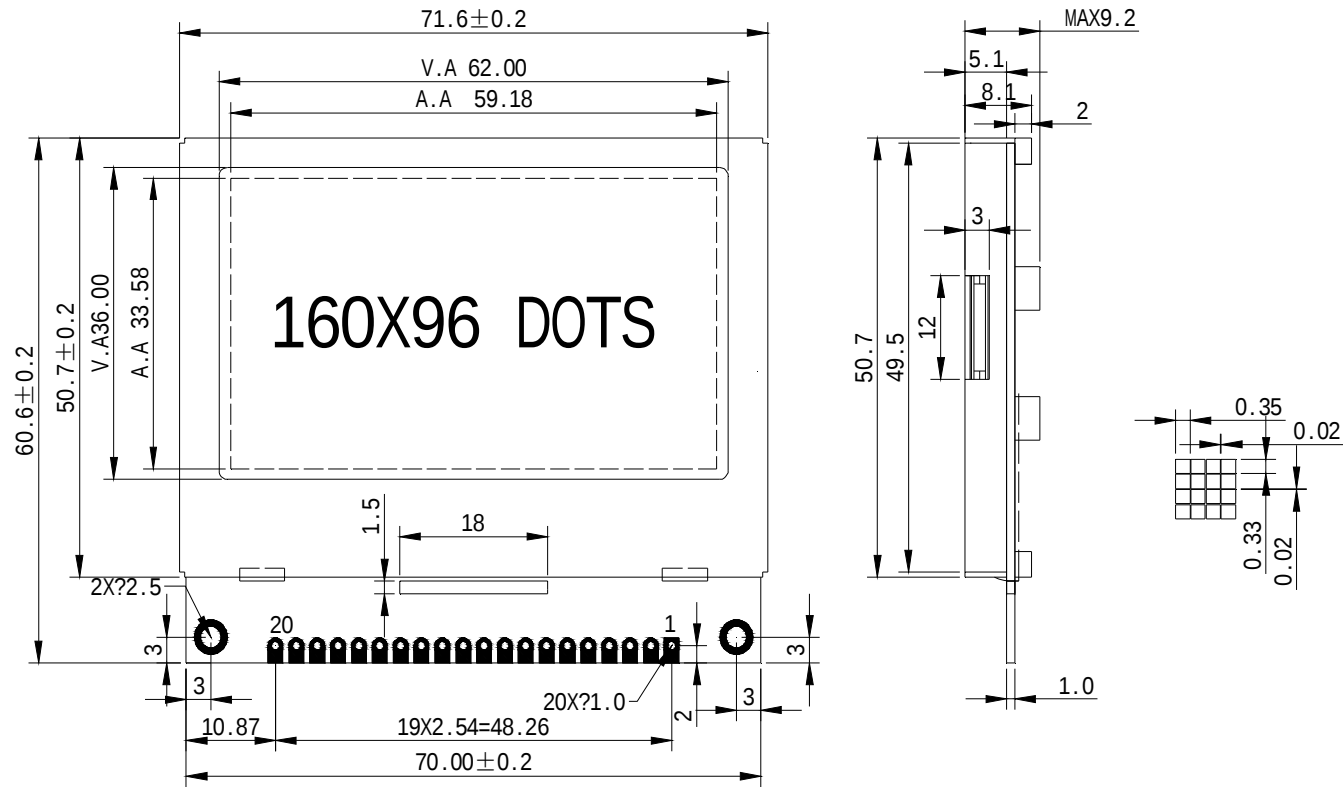
//写数据到 DDRAM

```
void send_dat(uchar dat) small
{
    check_busy();
    LCD_RS=1;
    LCD_RW=0;           //写数据
    LCD_CS1=0;          //片使能
    data_bus=dat;
    LCD_E=1;
    _nop_();
}
```

```
_nop();
LCD_E=0;
_nop();
_nop();
LCD_CS1=1;           //片禁能
}

//初始化
void lcd_initial(void) small
{
    LCD_RES=1;
    delay_nms(50);
    send_cmd(0xE2); //Software Reset
    send_cmd(0x57); //Set LCD Bias(1/11 bias)
    send_cmd(0x66); //DC-DC step-up(5 倍压设置)
    send_cmd(0xA0); //Set Segment Re-map
    send_cmd(0xC8); //Set COM output Scan Direction
    send_cmd(0x27); //Set Internal Regulator Resistor Raio
    send_cmd(0x81); //Set contrast Control Register
    send_cmd(0x10);
    send_cmd(0x48); //
    send_cmd(0x61); //
    send_cmd(0x40); //Set Display Start Line
    send_cmd(0x00); //Set Page Address
    send_cmd(0x44); //Set Higher column Address
    send_cmd(0x04); //Set lower column Address
    send_cmd(0xAF); //Set Display On
    send_cmd(0xAB); //Oscillator ON start
    send_cmd(0x2C); //Set Power Control Register
    send_cmd(0x2E);
    send_cmd(0x2F);
}
```

模块外形图



J1 接口定义

|     |     |    |    |           |         |     |     |     |     |     |     |     |     |     |    |      |     |      |      |
|-----|-----|----|----|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|------|-----|------|------|
| 1   | 2   | 3  | 4  | 5         | 6       | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16 | 17   | 18  | 19   | 20   |
| VSS | VDD | VO | RS | /WR (R/W) | /RD (E) | DB0 | DB1 | DB2 | DB3 | DB4 | DB5 | DB6 | DB7 | /CS | NC | /RST | VEE | LEDA | LEDK |