

DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 128064B SYH-PY

Product Specification

Version:4.1.1

04/Nov/2008

GENERAL SPECIFICATION

MODULE NO. :

DEM 128064B SYH-PY

CUSTOMER P/N

| VERSION NO. | CHANGE DESCRIPTION | DATE |
|-------------|-------------------------------------|------------|
| 0 | ORIGINAL VERSION | 15.03.2004 |
| 1 | CHANGE EXTERNAL DIMENSIONS | 06.04.2004 |
| 2 | CHANGED PCB DRAWING AND DESCRIPTION | 05.07.2004 |
| 3 | ADD VERSION | 28.06.2005 |
| 4 | MODIFY PCB DESCRIPTION | 24.03.2006 |
| 4.1.0 | CHANGE IC | 17.06.2008 |
| 4.1.1 | CHANGE BACKLIGHT DRAWING | 04.11.2008 |
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DATE: 11.04.2008

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1. FUNCTIONS & FEATURES

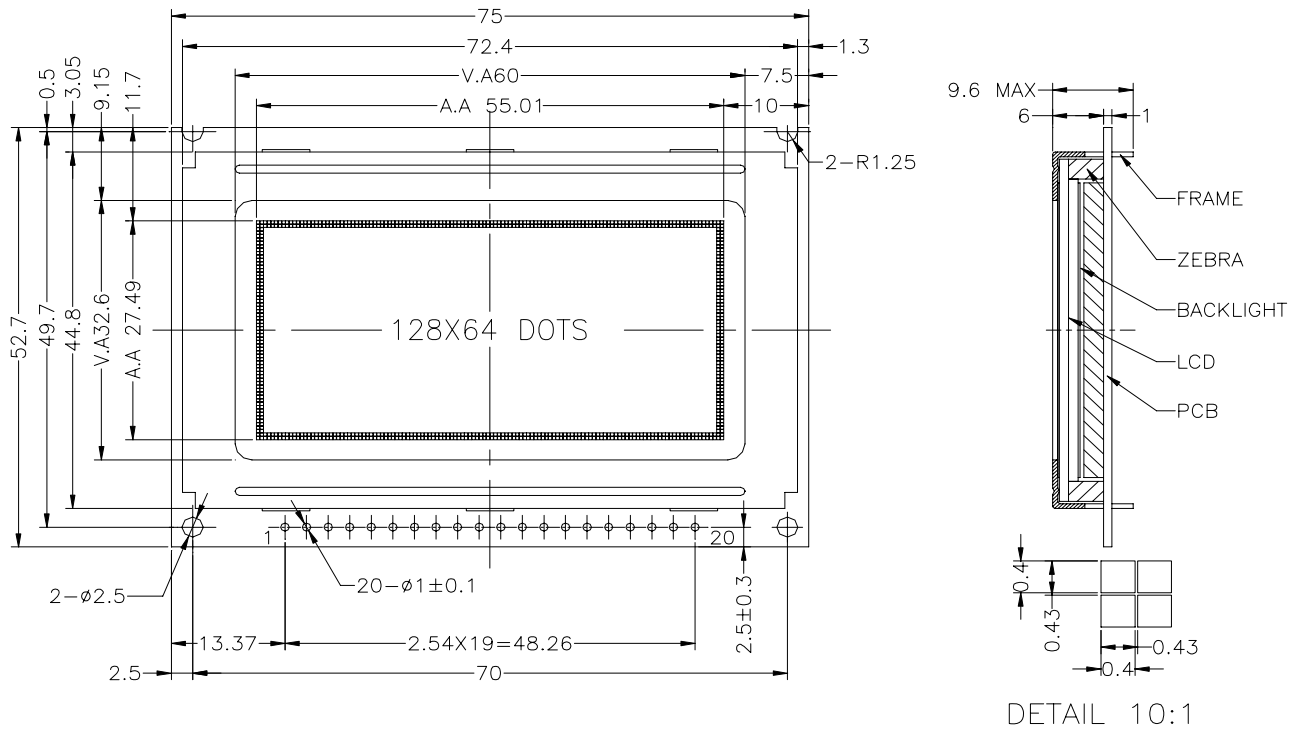
| MODULE | LCD TYPE |
|--------------------|--|
| DEM 128064B SYH-PY | STN Yellow Green Transflective Positive Mode |

- Viewing Direction : 6 o'clock
- Driving Scheme : 1/64 Duty Cycle, 1/9 Bias
- Power Supply Voltage : 5.0 Volt (typ.)
- Backlight : LED, Lightguide, Yellow Green
- V_{LCD} Adjustable For Best Contrast : 12.9 Volt (typ.)
- Display contents : 128 x 64 Dots
- Interface : 8 bit parallel display data from MPU
- Operating Temperature : -20°C to +70°C
- Storage Temperature : -30°C to +80°C

2. MECHANICAL SPECIFICATIONS

- Module Size : 75.00 x 52.7 x 9.60 mm
- Dot Size : 0.40 x 0.40 mm
- Dot Pitch : 0.43 x 0.43 mm
- Dot Gap : 0.03 mm

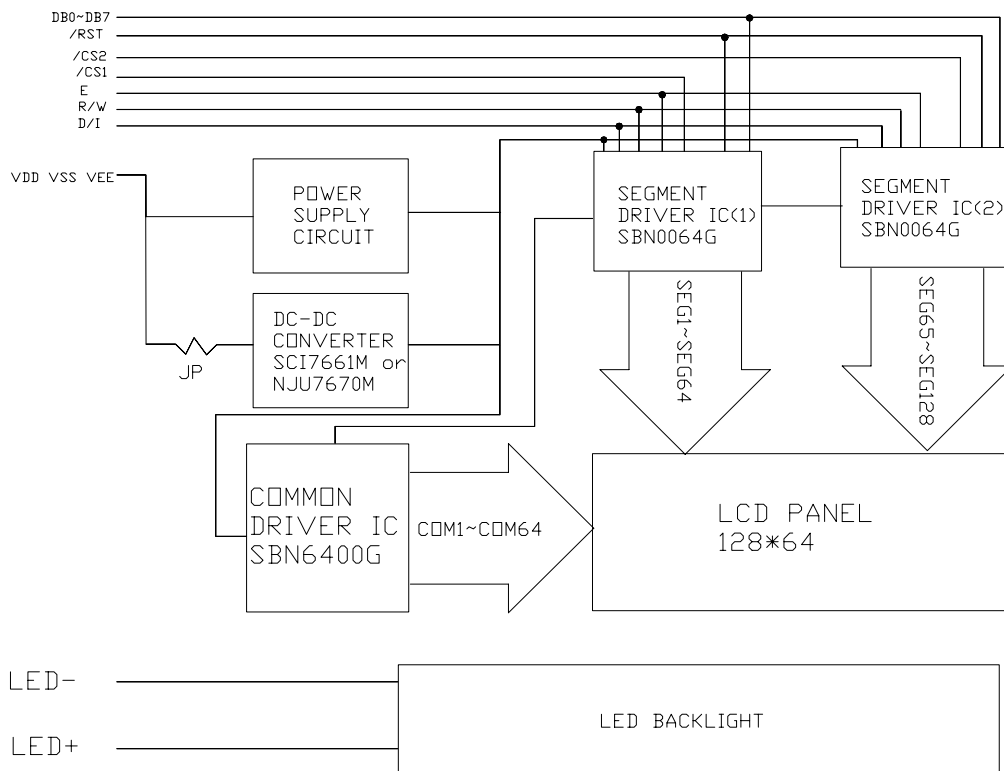
3. EXTERNAL DIMENSIONS



Remarks:

1. Unmarked tolerance is ± 0.3 ,
2. The material comply with RoHS.

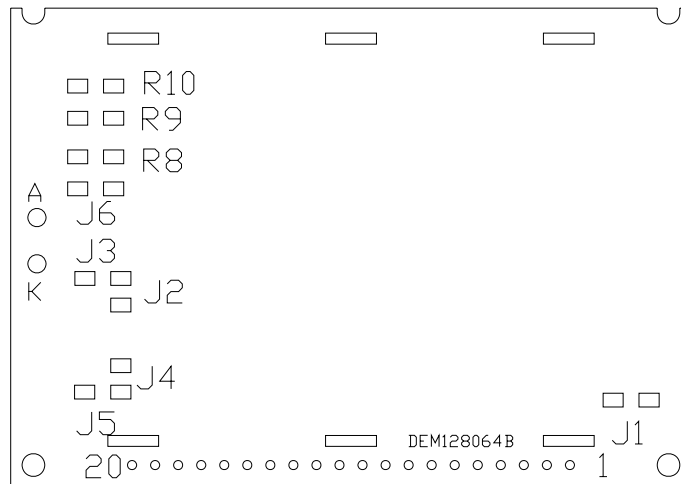
4. BLOCK DIAGRAM



5.PIN ASSIGNMENT

| Pin No. | Symbol | Function |
|----------------|-----------------|---|
| 1 | V _{DD} | POWER SUPPLY FOR LOGIC CIRCUIT |
| 2 | V _{SS} | GND |
| 3 | V ₀ | OPERATING VOLTAGE FOR LCD DRIVING |
| 4 | DB0 | DATE BUS. Three state I/O port. |
| 5 | DB1 | |
| 6 | DB2 | |
| 7 | DB3 | |
| 8 | DB4 | |
| 9 | DB5 | |
| 10 | DB6 | |
| 11 | DB7 | |
| 12 | CS1 | Chip select signal for IC1 |
| 13 | CS2 | Chip select signal for IC2 |
| 14 | /RST | Reset |
| 15 | R/W | H:DATA READ (LCM→ MPU) L:DATA WRITE (LCM→ MPU) |
| 16 | D/I | H:DATA INPUT;L:INSTRUCTION CODE INPUT |
| 17 | E | enable |
| 18 | VEE | POWER SUPPLY FOR LCD DRIVING |
| 19 | LED + (A) | Please refer to 6.1 drawing and description. |
| 20 | LED – (K) | |

5.1 PCB DRAWING AND DESCRIPTION



DESCRIPTION:

5-1-1.The polarity of the pin 19 and the pin 20:

| J3,J5 | J2, J4 | LED Polarity | |
|------------|------------|--------------|---------|
| | | 19 Pin | 20 Pin |
| Each open | Each close | Anode | Cathode |
| Each close | Each open | Cathode | Anode |

Note: In application module, J3=J5=open, J2=J4=closed

5-1-2.The LED resistor can be bridged when the J6 is closed.

Note: In application module, J6=open

5-1-3.The R8, R9 and R10 are the LED resistor.

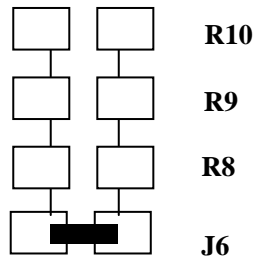
Note: In application module, R8=R9=R10=24Ohm

5-1-4. The metal-bezel is set on ground when the J1 is closed.

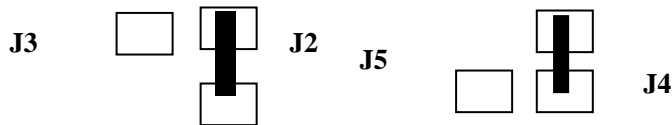
Note: In application module, J1=closed

5.2 Example application

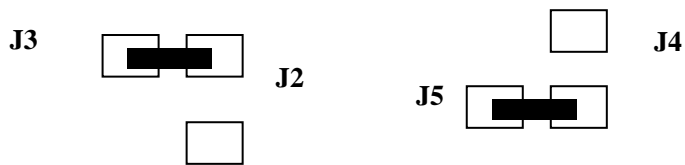
5-2-1. The LED resistor should be bridged as following.



5-2-2. The 19 pin is the anode and the 20 pin is the cathode as following.



5-2-3. The 19 pin is the cathode and the 20 pin is the anode as following.



5-2-4. The metal-bezel is ground as following.

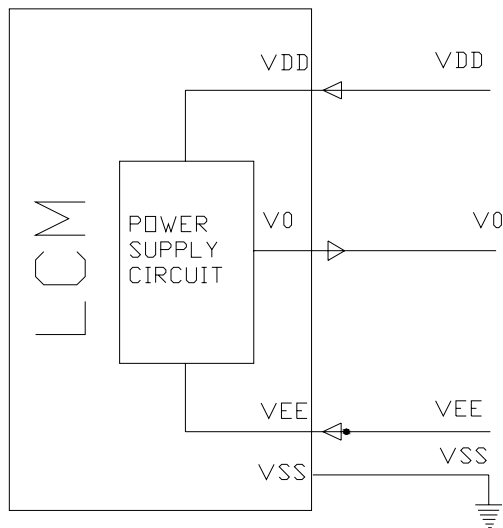


6. Absolute Maximum Ratings (Ta=25°C)

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|--------------------------|---|-----------------|------|-----------------|------|
| OPERATIONG TEMPERATURE | T _{OP} | -20 | --- | +70 | °C |
| STORAGE TEMPERATURE | T _{ST} | -30 | --- | +80 | °C |
| INPUT VOLTAGE | V _I | V _{SS} | --- | V _{DD} | V |
| SUPPLY VOLTAGE FOR LOGIC | V _{DD} - V _{SS} | -0.3 | --- | 7.0 | V |
| SUPPLY VOLTAGE FOR LCD | V _{DD} - V ₀ | -0.3 | --- | 19.0 | V |
| STATIC ELECTRICITY | Be sure that you are grounded when handling LCM | | | | |

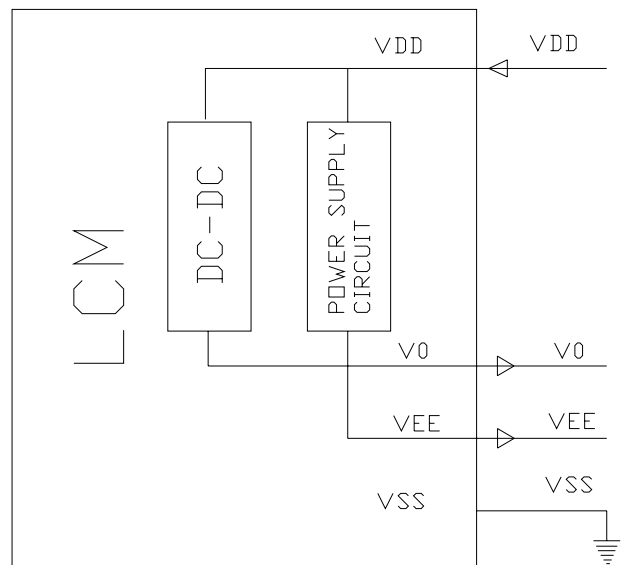
7. POWER SUPPLY FOR LCD MODULE

7.1 External power supply circuit



V_{DD}-V₀(V_{LCD}): LCD Driving voltage

7.2 Internal power supply circuit



V_{DD}-V₀(V_{LCD}): LCD Driving voltage

8. ELECTRICAL CHARACTERISTICS

8-1 DC Characteristics ($V_{DD}=+5\pm 10\%$ $V_{SS}=0V$, $T_a=-20\sim+70^{\circ}C$)

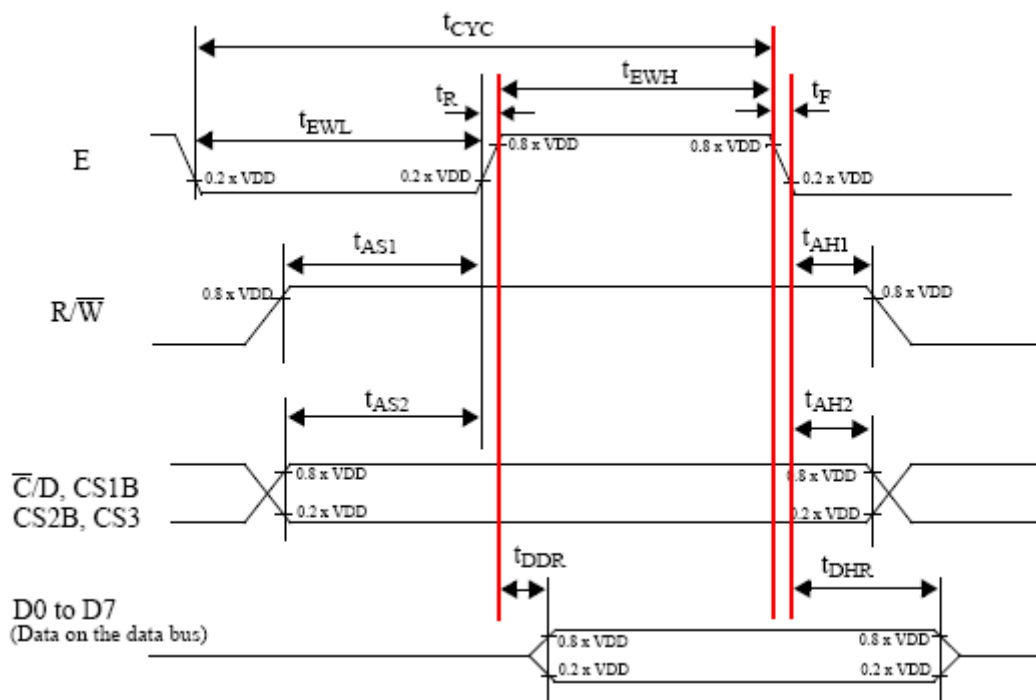
| Item | Symbol | Standard Value | | | Test Condition | Unit |
|-------------------------------|--------------|----------------|------|-------------|----------------|------|
| | | MIN | TYP | MAX | | |
| Supply current for logic | V_{DD} | 4.5 | 5.0 | 5.5 | ----- | V |
| Supply current for logic | I_{DD} | ---- | 2.62 | 4 | ----- | mA |
| operating Voltage for LCD | $V_{DD}-V_0$ | 13.4 | 14.1 | 14.8 | -20°C | V |
| | | 12.2 | 12.9 | 13.6 | 25°C | |
| | | 11.0 | 11.7 | 12.4 | 70°C | |
| Supply voltage for back light | V_F | --- | 4.2 | 4.6 | ----- | V |
| Supply current back light | I_F | --- | 380 | 500 | $V_F=4.2V$ | mA |
| Input voltage “H” level | V_{IH} | $0.7V_{DD}$ | --- | V_{DD} | --- | V |
| Input voltage “L” level | V_{IL} | 0 | --- | $0.3V_{DD}$ | --- | V |

8-2 AC Characteristics

8-2-1. AC timing for writing to the SBN0064G

($V_{DD} = 5\text{ V}$; $V_{SS} = 0\text{ V}$; $T_{amb} = 25^{\circ}\text{C}$)

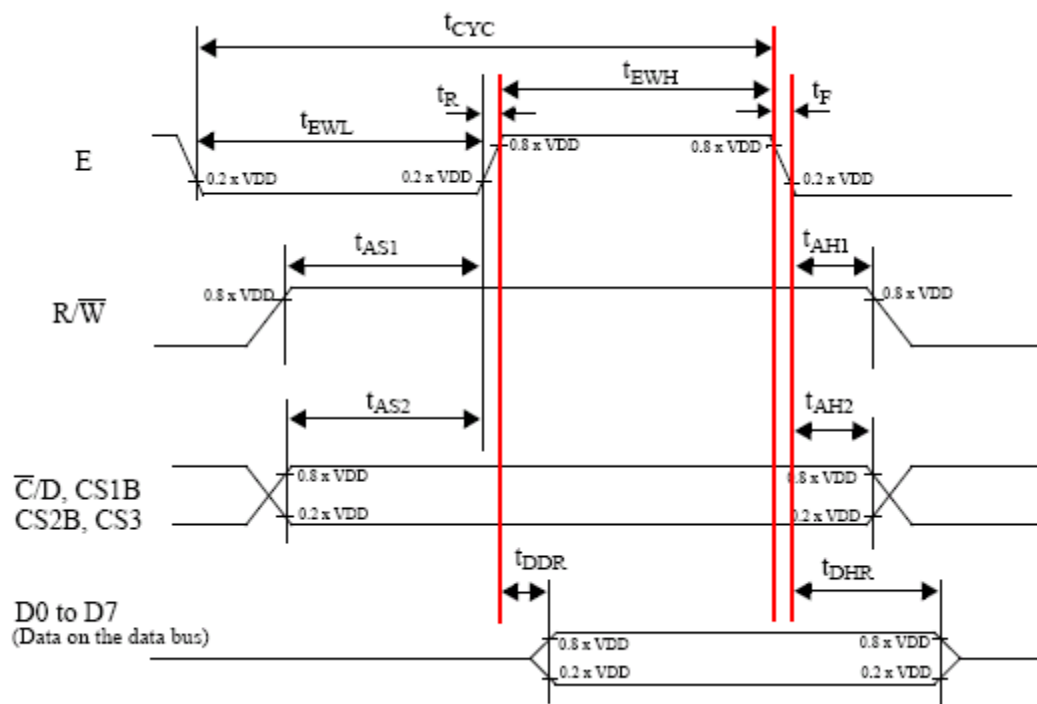
| symbol | parameter | min. | max. | test conditions | unit |
|-----------|-----------------------------------|------|------|--|------|
| t_{CYC} | Enable (E) cycle time | 1000 | | | ns |
| t_{EWL} | Enable (E) LOW width | 450 | | | |
| t_{EWH} | Enable (E) HIGH width | 450 | | | |
| t_R | Enable (R) rise time | | 20 | | |
| t_F | Enable (F) fall time | | 20 | | |
| t_{AS1} | Write set-up time | 140 | | | |
| t_{AH1} | Write hold time | 10 | | | |
| t_{AS2} | C/D, CS1B, CS2B, CS3 set-up time | 140 | | | |
| t_{AH2} | C/D, CS1B, CS2B, CS3 hold time | 10 | | | |
| t_{DSW} | Data setup time (on the data bus) | 200 | | The loading on the data bus is shown in Fig. 18. | |
| t_{DHW} | Data hold time (on the data bus) | 10 | | | |



8-2-2. AC timing for reading from the SBN0064G

($V_{DD} = 5\text{ V}$; $V_{SS} = 0\text{ V}$; $T_{amb} = 25^{\circ}\text{C}$.)

| symbol | parameter | min. | max. | test conditions | unit |
|-----------|-----------------------------------|------|------|--|------|
| t_{CYC} | Enable (E) cycle time | 1000 | | | ns |
| t_{EWL} | Enable (E) LOW width | 450 | | | |
| t_{EWH} | Enable (E) HIGH width | 450 | | | |
| t_R | Enable (R) rise time | | 20 | | |
| t_F | Enable (F) fall time | | 20 | | |
| t_{AS1} | READ set-up time | 140 | | | |
| t_{AH1} | READ hold time | 20 | | | |
| t_{AS2} | C/D, CS1B, CS2B, CS3 set-up time | 140 | | | |
| t_{AH2} | C/D, CS1B, CS2B, CS3 hold time | 10 | | | |
| t_{DDR} | Data delay time (on the data bus) | 320 | | The loading on the data bus is shown in Fig. 18. | |
| t_{DHR} | Data hold time (on the data bus) | 20 | | | |



9. DISPLAY CONTROL INSTRUCTION

Registers and their states after hardware RESET

The SBN0064G has 5 registers. Four of them must be programmed by the host microcontroller after hardware reset. The Status Register can be read by the host microcontroller to check the current status of the SBN0064G.

The registers and their states after RESET is given in Table 5.

Table 1 Registers and their states after RESET

| Register Name | Description | States after RESET |
|-----------------------------|---|--------------------|
| Display ON/OFF Register | The Display ON/OFF Register is a 1-bit register. After RESET, its value is LOW and, therefore, the LCD display is turned OFF. | 0 |
| Display Start Line Register | The Display Start Line Register is a 6-bit register. After RESET, its value is 00 0000 and, therefore, Row 0 of the Display Data Memory is mapped to COM0 of LCD panel. | 00 0000 |
| Page Address Register | The Page Address Register is a 3-bit register. It point to a page of the Display Data Memory. | xxx |
| Column Address Register | The Column Address Register is a 6-bit register. | xx xxxx |
| Status Register | The Status Register shows the current state of the SBN0064G. It is a 3-bit register, with each bit showing the status of a programmed function. | 0010 0000 |

9-1. Display ON/OFF and the Display ON/OFF Register

Table 2 Setting of the control bus for programming the Display ON/OFF Register

| C/D | R/W |
|-----|-----|
| 0 | 0 |

Table 3 Setting of the data bus for programming the Display ON/OFF Register

| D7(MSB) | D6 | D5 | D4 | D3 | D2 | D1 | D0(LSB) |
|---------|----|----|----|----|----|----|---------|
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | D0 |

When D0=1, the code is 3F(Hex) and the display is turned ON. When D0=0, the code is 3E(Hex) and the display is turned OFF.

9-2. Display Start Line and the Display Start Line Register

Table 4 The setting of the control bus for programming the Display Start Line Register

| C/D | R/W |
|-----|-----|
| 0 | 0 |

Table 5 The setting of the data bus for programming the Display Start Line Register

| D7(MSB) | D6 | D5 | D4 | D3 | D2 | D1 | D0(LSB) |
|---------|----|----|----|----|----|----|---------|
| 1 | 1 | A5 | A4 | A3 | A2 | A1 | A0 |

A5 ~ A0 are Display Start Line address bits and can be programmed with a value in the range from 0 to 63. Therefore, the code can be from 1100 0000 (C0 Hex) to 1111 1111 (FF Hex).

9-3. Display Data Memory Page and the Page Address Register

Table 6 The setting of the control bus for programming the Page Address Register

| C/D | R/W |
|-----|-----|
| 0 | 0 |

Table 7 The setting of the data bus for programming the Page Address Register

| D7(MSB) | D6 | D5 | D4 | D3 | D2 | D1 | D0(LSB) |
|---------|----|----|----|----|----|----|---------|
| 1 | 0 | 1 | 1 | 1 | A2 | A1 | A0 |

A2, A1 and A0 are page address bits and can be programmed with a value in the range from 0 to 7. A2 A1 A0=000 selects Page 0; A2 A1 A0=001 selects Page 1; A2 A1 A0=010 selects Page 2, and A2 A1 A0=011 selects Page 3...etc. Therefore, the code can be from 1011 1000 (B8 Hex) to 1011 1111 (BF Hex).

9-4. Column address and the Column Address Register

Table 8 The setting of the control bus for programming the Column Address Register

| C/D | R/W |
|-----|-----|
| 0 | 0 |

Table 9 The setting of the data bus for programming the Column Address Register

| D7(MSB) | D6 | D5 | D4 | D3 | D2 | D1 | D0(LSB) |
|---------|----|----|----|----|----|----|---------|
| 0 | 1 | A5 | A4 | A3 | A2 | A1 | A0 |

A5~A0 are column address bits and can be programmed with a value in the range from 0 to 63. Therefore, the code can be from 0100 0000 (40 Hex) to 0111 1111 (7F Hex).

9-5. Status Read and Status Register

Table 10 The setting of the control bus for reading the Status Register

| C/D | R/W |
|-----|-----|
| 0 | 1 |

Table 11 The Status Register bit allocation

| D7(MSB) | D6 | D5 | D4 | D3 | D2 | D1 | D0(LSB) |
|---------|----|--------|-------|----|----|----|---------|
| BUSY | 0 | ON/OFF | RESET | 0 | 0 | 0 | 0 |

Table 12 The Status Register bit description

| Bit | Description |
|--------|--|
| BUSY | BUSY=1 indicates that the SBN0064G is currently busy and can not accept new code or data. The SBN0064G is executing an internal operation. BUSY=0 indicates that the SBN0064G is not busy and is ready to accept new code or data. |
| ON/OFF | The ON/OFF bit indicates the current of status of display. If ON/OFF=0, the display has been turned ON. If ON/OFF=1, the display has been turned OFF. Note that the polarity of this bit is inverse to that of the Display ON/OFF Register. |
| RESET | RESET=1 indicates that the SBN0064G is currently in the process of being reset. RESET=0 indicates that the SBN0064G is currently in normal operation. |

9-6. READ OR WRITE OPERATION TO THE DISPLAY DATA MEMORY

Table 13 READ/WRITE operation

| Operation | DATA | | | | | | | | Description |
|--------------------|--|----|----|----|----|----|----|----|---|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| Write Display Data | Data to be written into the Display Data Memory. | | | | | | | | Write a byte of data to the Display Data Memory. The data to be written is put on the data bus by the host microcontroller. |
| Read Display Data | Data read from the Display Data Memory output latch. | | | | | | | | Read a byte of data from the Display Data Memory. The data read from the internal 8-bit output latch (refer to Fig. 12) appears on the data bus. A dummy read is needed to get correct value. |

Table 14 The setting of the control bus for Write Display Data operation

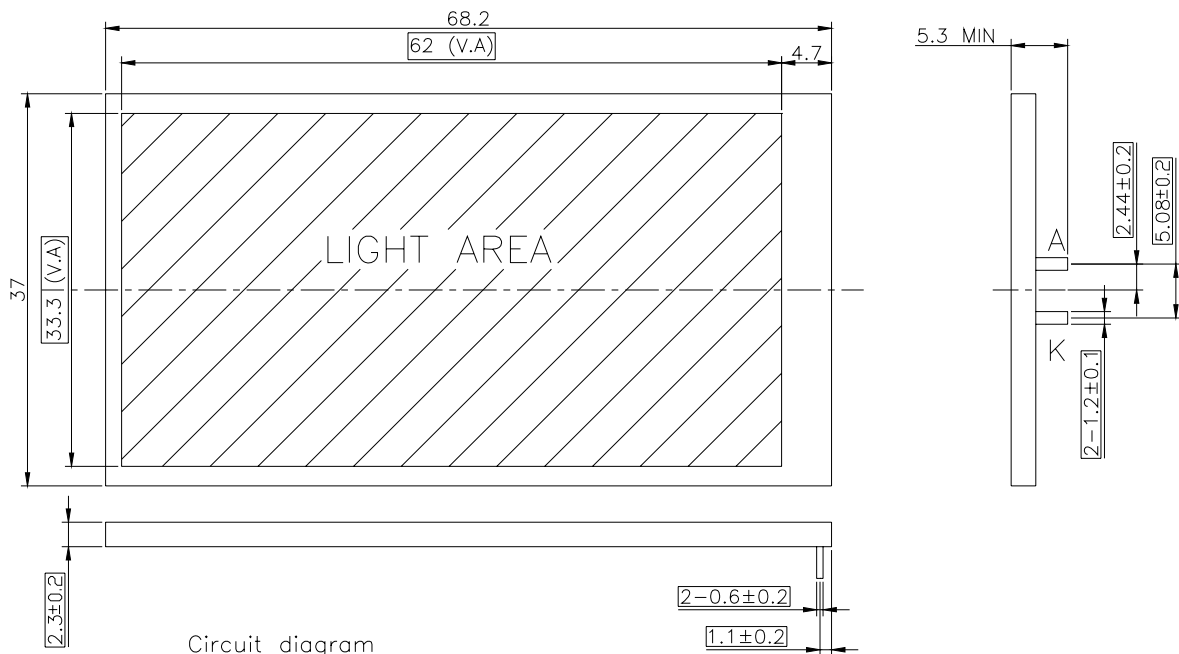
| C/D | R/W |
|-----|-----|
| 1 | 0 |

Table 15 The setting of the control bus for Read Display Data command

| C/D | R/W |
|-----|-----|
| 1 | 1 |

10. BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATIONS

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITION | NOTE |
|-------------------------------|----------------|------|-------|-------|-------------------|-----------------------|------|
| Supply Current | I | - | 40 | 80 | mA | - | - |
| Forward Voltage | V _f | 3.8 | 4.0 | 4.2 | V | I _f = 40mA | - |
| Reversr Voltage | V _r | - | - | 10 | V | - | - |
| Luminous Intensity | I _v | 30 | 40 | - | cd/m ² | I _f = 40mA | - |
| Luminous Intensity Uniformity | EH | 75 | - | - | % | I _f = 40mA | - |
| LED Peak Emission Wavelength | λ _p | 467 | 571 | 575 | Nm | I _f = 40mA | - |
| Life Time | - | - | 30000 | 20000 | Hrs. | I _f = 40mA | - |
| Color | Yellow Green | | | | | | |



REMARKS:
 1.UNMARKED TOLERANCE ±0.30,
 2.THE MATERIAL COMPLY WITH ROHS.

11. LCD MODULES HANDLING PRECAUTIONS

- Please remove the protective foil of polarizer before using.
- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD module.
 - Tools required for assembly, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - The LCD 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.
- Storage precautions
When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

12. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
 - Exposed area of the printed circuit board
 - Terminal electrode sections