

1. FEATURE :

| ITEMS | MECHANICAL SPECIFICATION |
|--|--------------------------|
| Module Dimension | 80.0 × 36.0 mm |
| Viewing Area | 66.0 × 16.0 mm |
| Mounting Hole | 75.0 × 31.0 mm |
| Character Size | 2.96 × 5.56 mm |
| 1. 5×8 dots with cursor | |
| 2. Built-in controller (KS 0066 or Equivalent) | |
| 3. +5V power supply | |
| 4. 1/16 duty cycle | |
| 5. N.V. optional for +3V power supply | |

2. ELECTRICAL CHARACTERISTICS :

| ITEM | SYM | CONDITION | MIN | TYP | MAX | UNIT |
|--|--------|------------------|-------|-----|-----|------|
| Input Voltage | VDD | VDD=+5V | 4.7 | 5.0 | 5.3 | V |
| Supply Current | IDD | VDD=5V | — | 1.2 | 1.5 | mA |
| Recommended LC Driving Voltage for Normal Temp. Version Module | VDD-V0 | -20°C | — | — | 5.2 | V |
| | | 0°C | — | — | 4.2 | |
| | | 25°C | — | 3.8 | — | |
| | | 50°C | 3.5 | — | — | |
| | | 70°C | 3.2 | — | — | |
| LED Forward Voltage | VF | 25°C | — | 4.2 | 4.6 | V |
| LED Forward Current | IF | 25°C | ARRAY | — | 130 | mA |
| | | | EDGE | — | 20 | |
| EL Power Supply Current | IEL | VEL=110VAC;400HZ | — | — | 5.0 | mA |

3. ABSOLUTE MAXIMUM RATINGS :

| ITEM | SYM | MIN | TYP | MAX | UNIT |
|---------------|---------|------|-----|-----|------|
| Power Supply | VDD-VSS | -0.3 | — | 7.0 | V |
| Input Voltage | VI | -0.3 | — | VDD | V |

4. INTERFACE PIN CONNECTIONS :

| NO | SYM | FUNCTION |
|----|-------|---|
| 1 | VSS | GND |
| 2 | VDD | +3V OR +5V |
| 3 | VO | CONTRAST ADJUSTMENT |
| 4 | RS | H/L REGISTER SELECT SIGNAL |
| 5 | R/W | H/L READ / WRITE SIGNAL |
| 6 | E | H→L ENABLE SIGNAL |
| 7 | DB0 | H/L DATA BUS LINE |
| 8 | DB1 | H/L DATA BUS LINE |
| 9 | DB2 | H/L DATA BUS LINE |
| 10 | DB3 | H/L DATA BUS LINE |
| 11 | DB4 | H/L DATA BUS LINE |
| 12 | DB5 | H/L DATA BUS LINE |
| 13 | DB6 | H/L DATA BUS LINE |
| 14 | DB7 | H/L DATA BUS LINE |
| 15 | A/VEE | 4.2V FOR LED (RA=0Ω)/NEGATIVE VOLTAGE OUTPUT |
| 16 | K | POWER SUPPLY FOR B/L (0V) |

5. DISPLAY CHARACTER ADDRESS CODE :

| | | | | | | | | | | | | | | | | |
|----|----|----|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 11 | 13 | 14 | 15 | 16 |
| L1 | 00 | 01 | | | | | | | | | | | | | | 0F |
| L2 | 40 | 41 | | | | | | | | | | | | | | 4F |

6. DIMENSIONAL DRAWING :

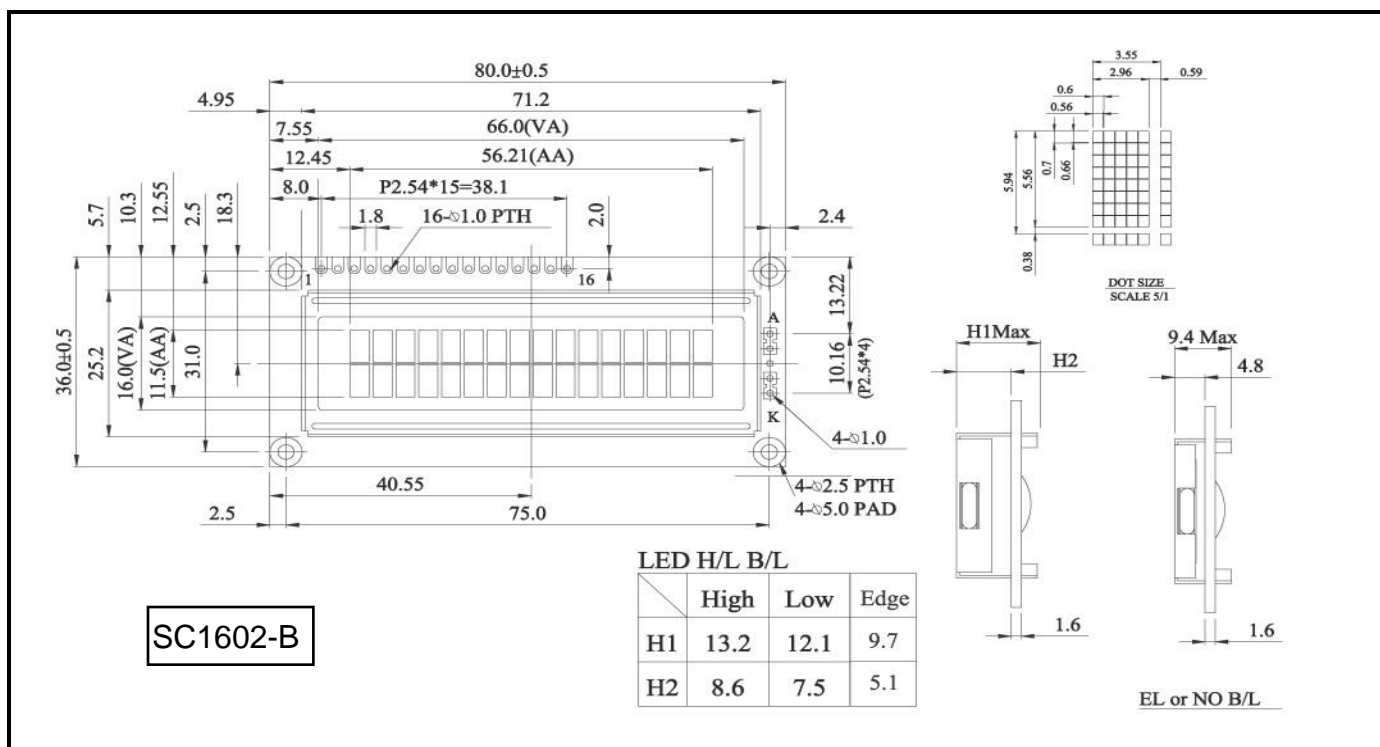


Table 1 Character Code/Character Pattern Correspondence Chart

| Upper 4 bits Lower 4 bits | 0000 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|------------------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| xxxx0000 | CG RAM (1) | | 0 | a | P | \ | P | - | 9 | E | | o | p |
| xxxx0001 | (2) | ! | 1 | Q | O | a | q | a | 7 | + | 4 | a | q |
| xxxx0010 | (3) | " | 2 | B | R | b | r | r | 4 | W | X | P | o |
| xxxx0011 | (4) | # | 3 | C | S | c | s | J | 9 | + | E | e | w |
| xxxx0100 | (5) | \$ | 4 | D | T | d | t | \ | I | t | t | P | o |
| xxxx0101 | (6) | % | 5 | E | U | e | u | . | + | + | 1 | e | o |
| xxxx0110 | (7) | & | 6 | F | V | f | v | 7 | + | + | 3 | P | Σ |
| xxxx0111 | (8) | ' | 7 | G | W | g | w | 7 | + | + | 7 | g | π |
| xxxx1000 | (1) | (| 8 | H | X | h | x | 4 | 9 | * | U | r | X |
| xxxx1001 | (2) |) | 9 | I | Y | i | y | 9 | 9 | 7 | U | ~ | y |
| xxxx1010 | (3) | * | : | J | Z | j | z | + | 3 | n | V | j | + |
| xxxx1011 | (4) | + | : | K | L | k | l | (| + | 9 | E | * | π |
| xxxx1100 | (5) | , | < | L | * | 1 | 1 | t | 9 | 7 | 7 | + | π |
| xxxx1101 | (6) | - | = | M | I | m | i | + | + | + | + | t | ÷ |
| xxxx1110 | (7) | . | > | N | ^ | n | + | 9 | + | + | + | π | |
| xxxx1111 | (8) | / | ? | O | _ | o | + | W | Y | 7 | + | o | |

Note: The CG RAM is a character generator RAM that stores character patterns that may be freely rewritten by the user.

Table 2 Instruction Functions

| Instruction | Code | | | | | | | | | | Description | Execution time (when $f_{osc} = 250 \text{ kHz}$) | |
|---------------------------|--|-----|------------|-----|-----|-----|-----|-----------------------------------|---|---|---|---|--|
| | RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | | | |
| Display clear | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Clears the whole display and then returns the cursor to the home position (location 0). | 82 μs to 1.64 ms | |
| Cursor home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | * | Returns the cursor to the home position. Also restores a shifted display. The contents of DD RAM are not changed. | 40 μs to 1.6 ms | |
| Entry mode set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S | Sets the cursor advance position and whether the display shifts. These operations are performed when data is read or written. | 40 μs | |
| Display on/off control | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | Sets the display on/off state (D), the cursor on/off state (C), and the blinking state (B) of the character at the cursor position. | 40 μs | |
| Cursor/display shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | * | * | Performs cursor motion and display shift without changing the contents of DD RAM. | 40 μs | |
| Function set | 0 | 0 | 0 | 0 | 1 | DL | N | F | * | * | Sets the interface data length (DL), the number of display lines (N), and the character font (F). | 40 μs | |
| CG RAM address set | 0 | 0 | 0 | 1 | ACG | | | | | Sets the CG RAM address. The next data transmitted will be CG RAM data. | | 40 μs | |
| DD RAM address set | 0 | 0 | 1 | ADD | | | | | Sets the DD RAM address. The next data transmitted will be DD RAM data. | | 40 μs | | |
| Busy flag/address readout | 0 | 1 | BF | AC | | | | | Reads out the busy flag (BF), which indicates the internal operation in progress state, and the contents of the address register. | | 1 μs | | |
| CG RAM/DD RAM data write | 1 | 0 | Write data | | | | | Writes to DD RAM or CG RAM. | | 40 μs | | | |
| CG RAM/DD RAM data read | 1 | 1 | Read data | | | | | Reads data from DD RAM or CG RAM. | | 40 μs | | | |
| | I/D = 1: Increment (+1) I/D = 0: Decrement (-1) S = 1: Display shift at the same time S/C = 1: Display shift S/C = 0: Cursor move R/L = 1: Right shift R/L = 0: Left shift DL = 1: 8 bits, DL = 0: 4 bits N = 1: 2 lines, N = 0: 1 line F = 1: 5 \times 10 dots, F = 0: 5 \times 7 dots BF = 1: Internal operation in progress BF = 0: Instructions accepted *: Invalid (don't care) | | | | | | | | | | DD RAM: Display data RAM CG RAM: Character generator RAM ACG: A CG RAM address ADD: Corresponds to a DD RAM address AC: The address counter, which is used for both DD and CG RAMs. | | The execution times will change if the internal oscillator frequency is changed. Example: If an f_{osc} of 270 kHz is used, then a 40 μs time from this chart will become $40 \mu\text{s} \times 250/270 = 37 \mu\text{s}$. |

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