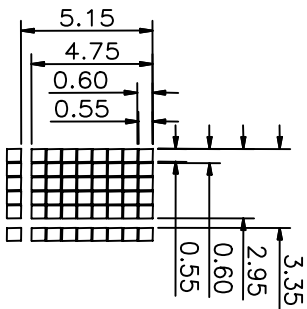
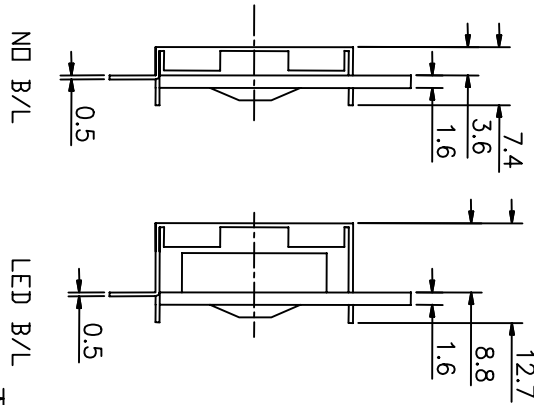
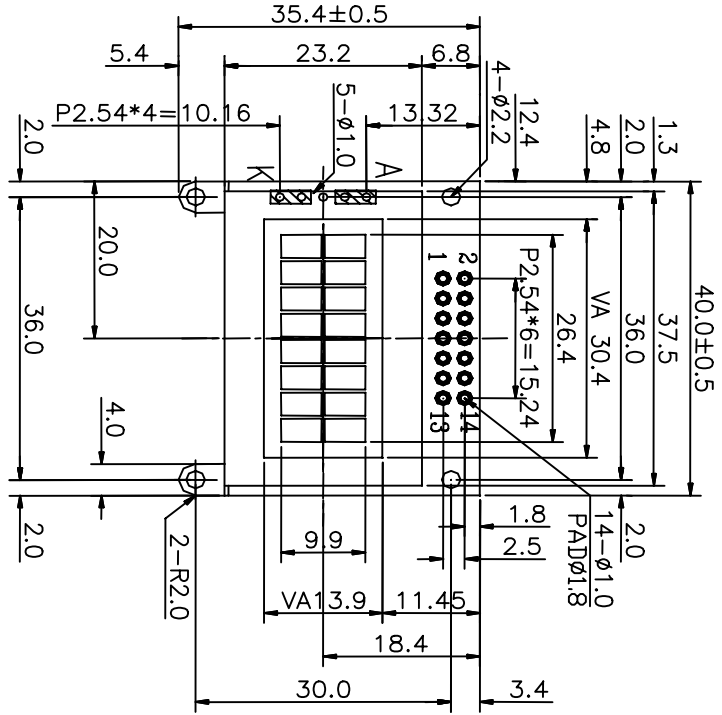


## GENERAL SPECIFICATION

| ITEM              | DESCRIPTION  |  |  |                                     |                                     |
|-------------------|--|--|--|-------------------------------------|-------------------------------------|
| Product No        | SC0802EBMB-XA-GB-G                                   |  |  |                                     |                                     |
| LCD Type          | <input type="checkbox"/> STN Gray Positive           | <input type="checkbox"/> STN Yellow Green Positive |  | STN Blue Negative                   |                                     |
|                   | <input type="checkbox"/> TN Negative                 |  | <input type="checkbox"/> TN Positive                 |                                     |                                     |
|                   | <input type="checkbox"/> FSTN Negative White & Black |  | <input type="checkbox"/> FSTN Positive Black & White |                                     |                                     |
| Rear Polarizer    | <input type="checkbox"/> Reflective                  |  | <input type="checkbox"/> Transflective               | Transmissive                        |                                     |
| Backlight Type    | <input type="checkbox"/> NO B/L                      | LED  |  | <input type="checkbox"/> CCFL       | <input type="checkbox"/> EL         |
| Backlight Color   | <input type="checkbox"/> Yellow Green                | <input type="checkbox"/> Green                     | Amber  | <input type="checkbox"/> White      | <input type="checkbox"/> Blue Green |
| View Direction    | 6 O'clock  |  |  | <input type="checkbox"/> 12 O'clock |                                     |
| Temperature Range | Normal   |  |  | <input type="checkbox"/> Wide       |                                     |
| Frame             | Black  |  |  | <input type="checkbox"/> Silver     |                                     |

### TO BE VERY CAREFUL !

The LCD driver ICs are made by CMOS process, which are very easy to be damaged by static charge, make sure the user is grounded when handling the LCM.



SCALE 3:1

| PIN NO | SIGNAL |
|--------|--------|
| 1      | VSS    |
| 2      | VDD    |
| 3      | V0     |
| 4      | RS     |
| 5      | R/W    |
| 6      | E      |
| 7      | DB0    |
| 8      | DB1    |
| 9      | DB2    |
| 10     | DB3    |
| 11     | DB4    |
| 12     | DB5    |
| 13     | DB6    |
| 14     | DB7    |

| NOTE | ITEM | CONTENT       | DATA       | REV | TOLERANCE | SCALE | UNITS | CHKD | DWN   | DATE       | CUSTOMER | APVLT | TITLE  | MODEL   | DWG NO    | PAGE |
|------|------|---------------|------------|-----|-----------|-------|-------|------|-------|------------|----------|-------|--------|---------|-----------|------|
|      |      | CHANGE NUMBER | 2004.03.01 | 0   | X ±0.30   | 1/1   | mm    | Hsu  | G-111 | 2004.03.01 |          |       | MODULE | SC0802E | A-A1-0041 | 1/1  |
|      |      |               |            |     | X ±0.20   |       |       |      |       |            |          |       |        |         |           |      |
|      |      |               |            |     | .XX±0.05  |       |       |      |       |            |          |       |        |         |           |      |
|      |      |               |            |     |           |       |       |      |       |            |          |       |        |         |           |      |

SUNLIKE DISPLAY

## ABSOLUTE MAXIMUM RATING

### (1) Electrical Absolute Ratings

| Item                   | Symbol          | Min. | Max.     | Unit | Note |
|------------------------|-----------------|------|----------|------|------|
| Power Supply for Logic | $V_{DD}-V_{SS}$ | -0.3 | 7.0      | Volt |      |
| Power Supply for LCD   | $V_{DD}-V_O$    | -0.3 | 10.0     | Volt |      |
| Input Voltage          | $V_I$           | -0.3 | $V_{DD}$ | Volt |      |
| LED Power Dissipation  | $P_{AD}$        | -    | 345      | mW   |      |
| LED Forward current    | $I_{AF}$        | -    | 75       | mA   |      |
| LED Reverse Voltage    | $V_R$           | -    | 8        | V    |      |

### (2) Environmental Absolute Maximum Ratings

| Item                           | Normal Temperature |      |          |      | Wide Temperature |      |          |      |
|--------------------------------|--------------------|------|----------|------|------------------|------|----------|------|
|                                | Operating          |      | Storage  |      | Operating        |      | Storage  |      |
|                                | Min,               | Max. | Min,     | Max. | Min,             | Max. | Min,     | Max. |
| Ambient Temperature            | 0                  | +50  | -20      | +70  | -20              | +70  | -30      | +80  |
| Humidity(without condensation) | Note 2,4           |      | Note 3,5 |      | Note 4,5         |      | Note 4,6 |      |

Note 2  $T_a = 50$  : 80% RH max

$T_a > 50$  : Absolute humidity must be lower than the humidity of 85%RH at 50

Note 3  $T_a$  at -20 will be <48hrs at 70 will be <120hrs when humidity is higher than 70%.

Note 4 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note 5  $T_a = 70$  : 75RH max

$T_a > 70$  : absolute humidity must be lower than the humidity of 75%RH at 70

Note 6  $T_a$  at -30 will be <48hrs, at 80 will be <120hrs when humidity is higher than 70%.

## ELECTRICAL CHARACTERISTICS

| Item                                     | Symbol          | Condition                          | Min. | Typ | Max.     | Unit | note |
|--|-----------------|------------------------------------|------|-----|----------|------|------|
| Power Supply for Logic                   | $V_{DD}-V_{SS}$ | -                                  | 4.5  | 5.0 | 5.5      | Volt |      |
| Input Voltage                            | $V_{IL}$        | L level                            | 0    | -   | 0.6      | Volt |      |
|  | $V_{IH}$        | H level                            | 2.2  | -   | $V_{DD}$ | Volt |      |
| LCM Recommend LCD Module Driving Voltage | $V_{DD}-V_O$    | Ta = 0                             | -    | -   | -        | Volt |      |
|  |                 | Ta = 25                            | 4.2  | 4.5 | 4.8      |      |      |
|  |                 | Ta = 50                            | -    | -   | -        |      |      |
| Power Supply Current for LCM             | $I_{DD}$        | $V_{DD}=5.0V$<br>$V_{DD}-V_O=4.5V$ | -    | 1.5 | 2.0      | mA   |      |
| LED Forward Voltage                      | $V_F$           | If = 50 mA                         | -    | 4.1 | 4.6      | Volt |      |
| LED Forward Current                      | $I_F$           | -                                  | -    | 50  | -        | mA   |      |
| LED Reverse Current                      | $I_R$           | VR=8V                              | -    | -   | 0.2      | mA   |      |

## OPTICAL CHARACTERISTICS

| Item                        | Symbol        | Condition                  | Min. | Typ | Max. | Unit              | note |
|-----------------------------|---------------|----------------------------|------|-----|------|-------------------|------|
| Viewing angle range         | f(12 o'clock) | When Cr<br>1.4             | -    | 20  | -    | Degree            | 9,10 |
|                             | b(6 o'clock)  |                            | -    | 40  | -    |                   |      |
|                             | l(9 o'clock)  |                            | -    | 30  | -    |                   |      |
|                             | r(3 o'clock)  |                            | -    | 30  | -    |                   |      |
| Rise Time                   | Tr            | $V_{DD}-V_O=4.5V$<br>Ta=25 |      | 100 | 200  | mS                |      |
| Fall Time                   | Tf            |                            |      | 200 | 350  |                   |      |
| Frame frequency             | Frm           |                            | -    | 64  | -    | Hz                | 8,10 |
| Contrast                    | Cr            |                            | -    | 3.0 | -    |                   | 7    |
| The Brightness Of Backlight | L             | IF=50 mA                   | 100  | 120 | -    | cd/m <sup>2</sup> |      |
| Peak Emission Wavelength    | P             |                            | 600  | 605 | 610  | nm                |      |

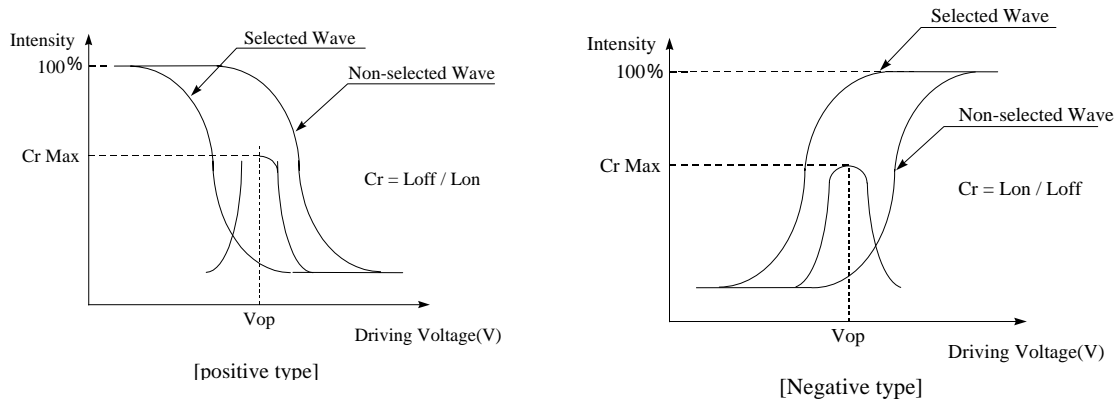
## MECHANICAL SPECIFICATION

| ITEM           | DESCRIPTION                         |
|----------------|-------------------------------------|
| Product No.    | SC0802E                             |
| Module Size    | 40.0(W)×35.4(H)×7.4(LED12.7) max(D) |
| Viewing Area   | 30.4(W)mm×13.9(H)mm                 |
| Dot Size       | 0.55(W)mm×0.55(H)mm                 |
| Dot Pitch      | 0.60(W)mm×0.60(H)mm                 |
| Display Format | 8 characters (W)×2 lines (H)        |
| Duty Ratio     | 1/16 Duty                           |
| Controller     | ST7066U or Equivalent               |

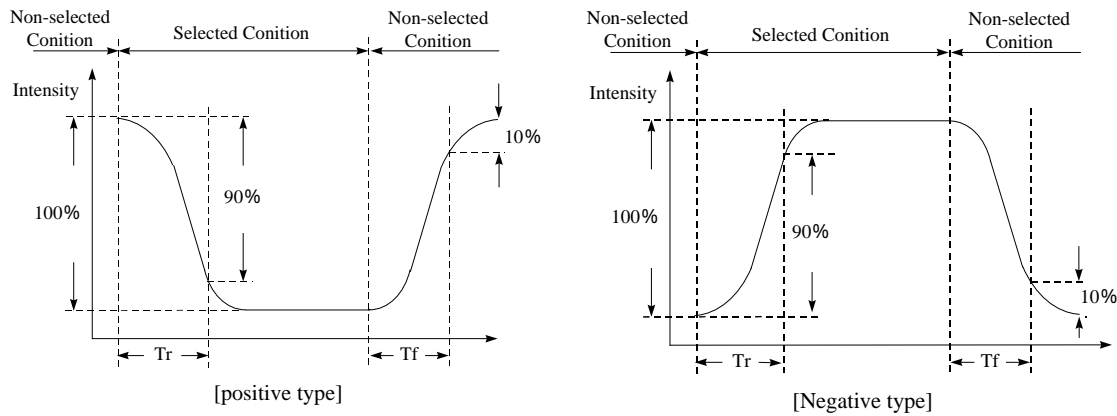
## INTERFACE PIN ASSIGNMENT

| Pin No. | Pin Out | Level | Description          |
|---------|---------|-------|----------------------|
| 1       | VSS     | 0V    | Power Supply Ground  |
| 2       | VDD     | 5V    | Power Supply Voltage |
| 3       | Vo      | ---   | Contrast Adj         |
| 4       | RS      | H/L   | Register Select      |
| 5       | R/W     | H/L   | Read / Write         |
| 6       | E       | H,H L | Enable Signal        |
| 7       | DB0     | H/L   | Data Bit 0           |
| 8       | DB1     | H/L   | Data Bit 1           |
| 9       | DB2     | H/L   | Data Bit 2           |
| 10      | DB3     | H/L   | Data Bit 3           |
| 11      | DB4     | H/L   | Data Bit 4           |
| 12      | DB5     | H/L   | Data Bit 5           |
| 13      | DB6     | H/L   | Data Bit 6           |
| 14      | DB7     | H/L   | Data Bit 7           |

### [Note 7] Definition of Operation Voltage (Vop)



### [Note 8] Definition of Response Time (Tr, Tf)



### Conditions:

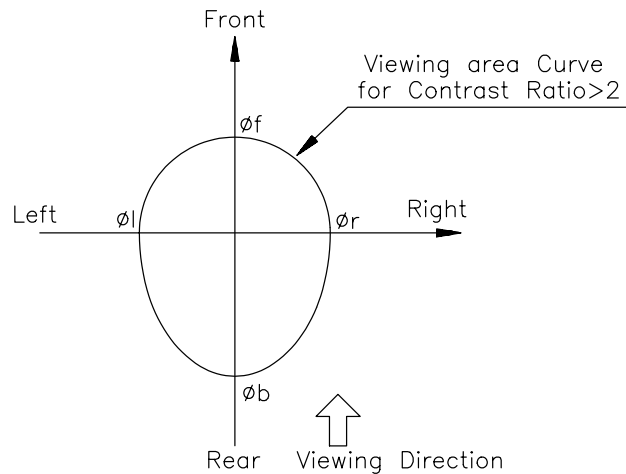
**Operating Voltage : Vop**

**Frame Frequency : 64 Hz**

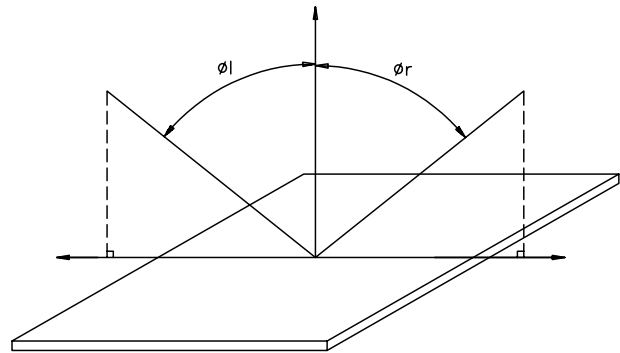
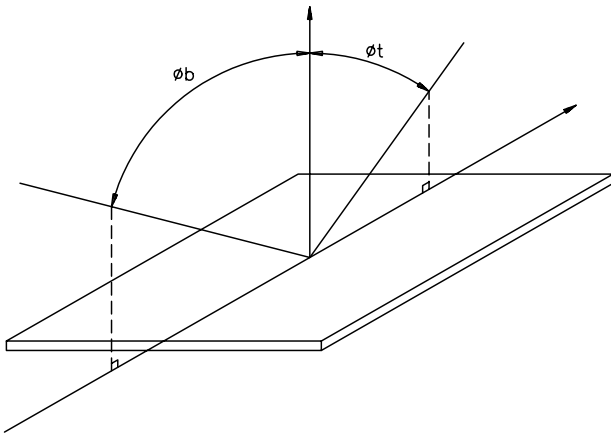
**Viewing Angle( , ): 0° , 0°**

**Driving Wave form : 1/N duty, 1/a bias**

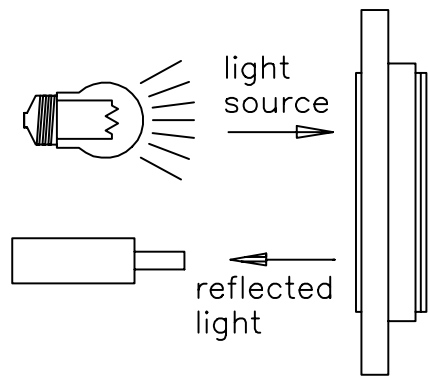
### [Note 9] Definition of Viewing Direction



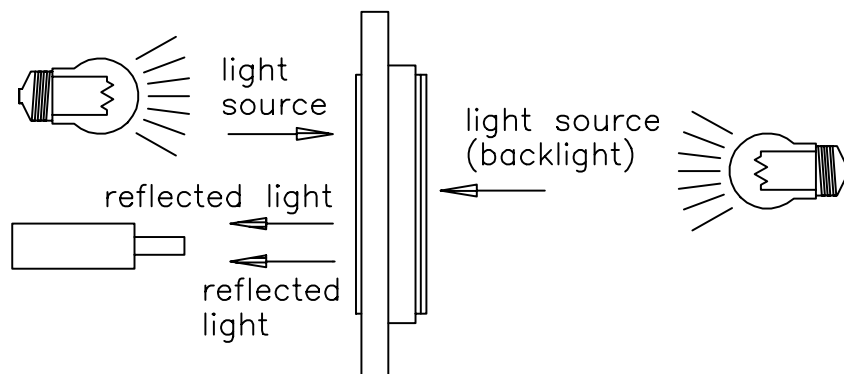
## [Note 10] Definition of viewing angle



## [Note 11] Description of Measuring Equipment

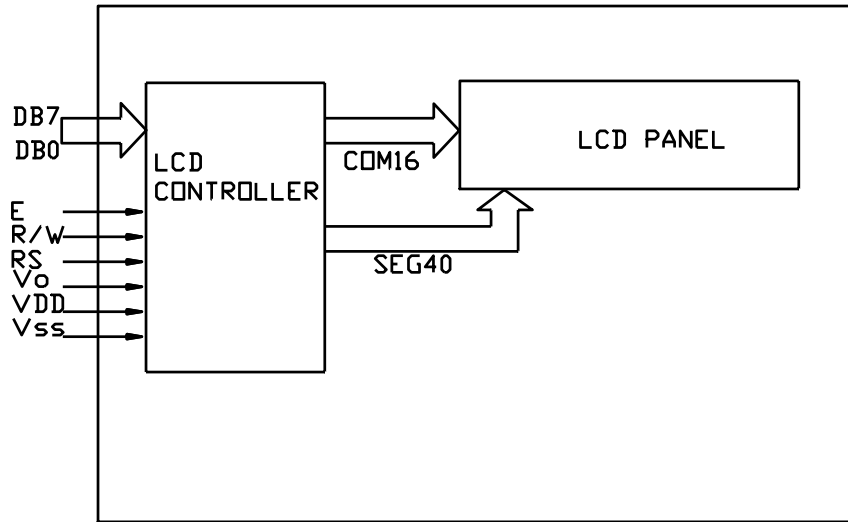


Reflective type

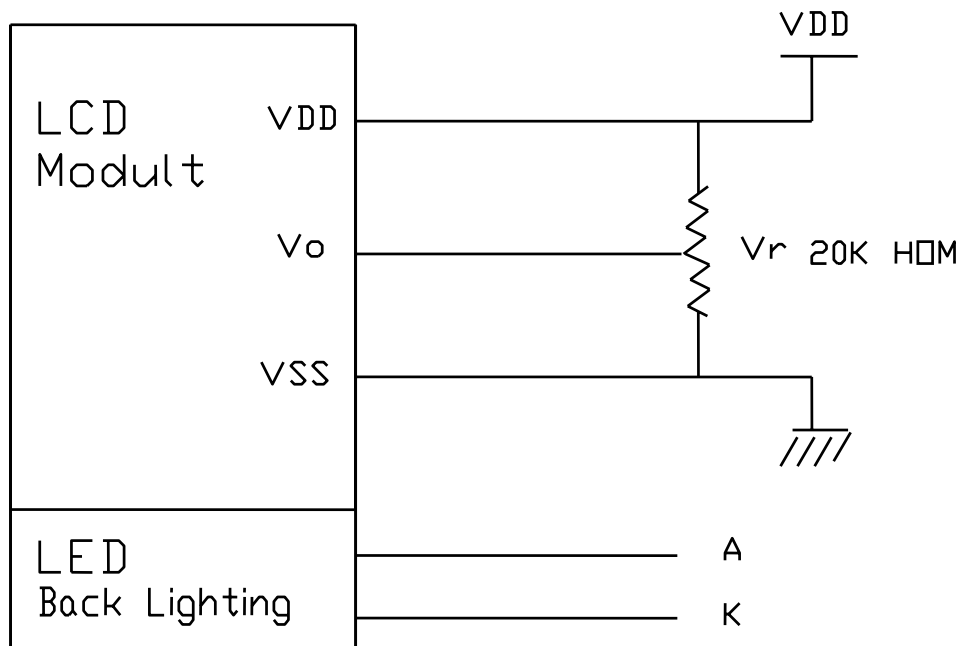


Transflective type

## BLOCK DIAGRAM



## POWER SUPPLY





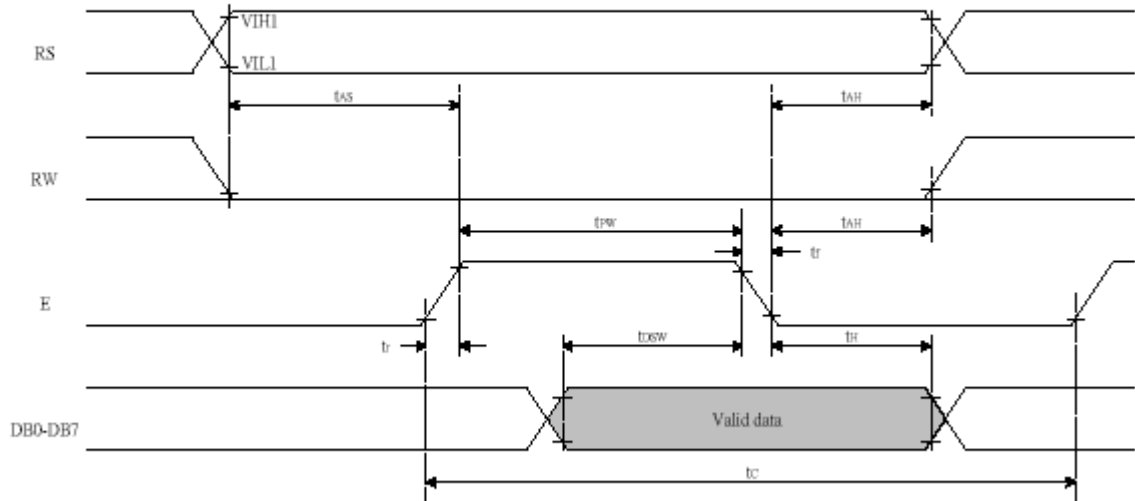
## TIMING CHARACTERISTICS

TA=25 ,VCC=5V

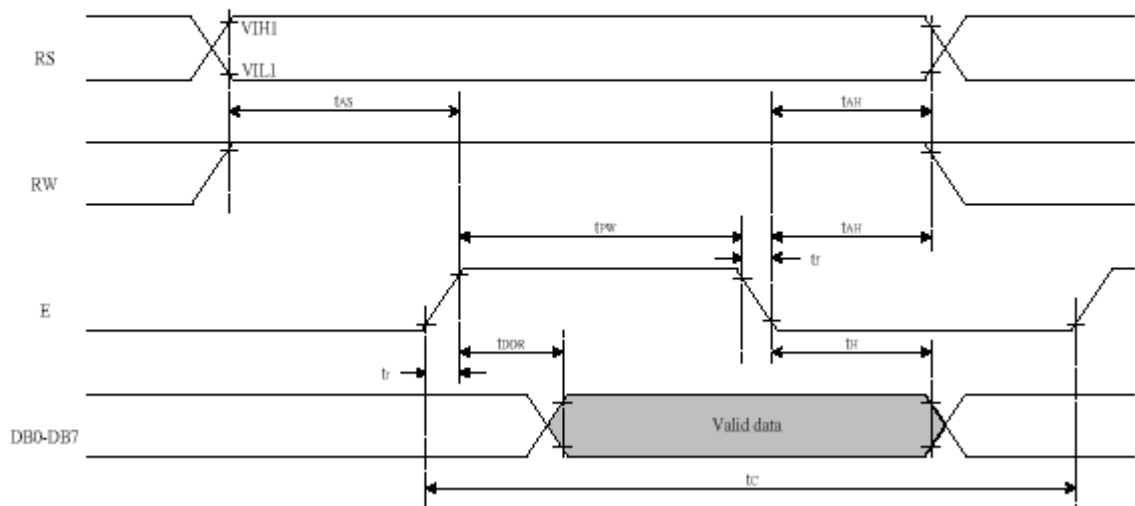
| Symbol   | Characteristics       | Test Condition  | Min. | Typ. | Max. | Unit |
|--|-----------------------|-----------------|------|------|------|------|
| <i>Internal Clock Operation</i>                      |                       |                 |      |      |      |      |
| f <sub>osc</sub>                                     | OSC Frequency         | R = 91KΩ        | 190  | 270  | 350  | KHz  |
| <i>External Clock Operation</i>                      |                       |                 |      |      |      |      |
| f <sub>EX</sub>                                      | External Frequency    | -               | 125  | 270  | 410  | KHz  |
|  | Duty Cycle            | -               | 45   | 50   | 55   | %    |
| T <sub>R</sub> ,T <sub>F</sub>                       | Rise/Fall Time        | -               | -    | -    | 0.2  | μs   |
| <i>Write Mode (Writing data from MPU to ST7066U)</i> |                       |                 |      |      |      |      |
| T <sub>C</sub>                                       | Enable Cycle Time     | Pin E           | 1200 | -    | -    | ns   |
| T <sub>PW</sub>                                      | Enable Pulse Width    | Pin E           | 140  | -    | -    | ns   |
| T <sub>R</sub> ,T <sub>F</sub>                       | Enable Rise/Fall Time | Pin E           | -    | -    | 25   | ns   |
| T <sub>AS</sub>                                      | Address Setup Time    | Pins: RS,RW,E   | 0    | -    | -    | ns   |
| T <sub>AH</sub>                                      | Address Hold Time     | Pins: RS,RW,E   | 10   | -    | -    | ns   |
| T <sub>DSW</sub>                                     | Data Setup Time       | Pins: DB0 - DB7 | 40   | -    | -    | ns   |
| T <sub>H</sub>                                       | Data Hold Time        | Pins: DB0 - DB7 | 10   | -    | -    | ns   |
| <i>Read Mode (Reading Data from ST7066U to MPU)</i>  |                       |                 |      |      |      |      |
| T <sub>C</sub>                                       | Enable Cycle Time     | Pin E           | 1200 | -    | -    | ns   |
| T <sub>PW</sub>                                      | Enable Pulse Width    | Pin E           | 140  | -    | -    | ns   |
| T <sub>R</sub> ,T <sub>F</sub>                       | Enable Rise/Fall Time | Pin E           | -    | -    | 25   | ns   |
| T <sub>AS</sub>                                      | Address Setup Time    | Pins: RS,RW,E   | 0    | -    | -    | ns   |
| T <sub>AH</sub>                                      | Address Hold Time     | Pins: RS,RW,E   | 10   | -    | -    | ns   |
| T <sub>DDR</sub>                                     | Data Setup Time       | Pins: DB0 - DB7 | -    | -    | 100  | ns   |
| T <sub>H</sub>                                       | Data Hold Time        | Pins: DB0 - DB7 | 10   | -    | -    | ns   |

## Read/Write Timing Chart

- Writing data from MPU to ST7066U



- Reading data from ST7066U to MPU



## Commands

| Instruction                | Instruction Code |     |     |     |     |     |     |     |     |     | Description | Description Time (270KHz)  |         |
|----------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|--|---------|
|                            | RS               | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |             |  |         |
| Clear Display              | 0                | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1           | Write "20H" to DDRAM. and set DDRAM address to "00H" from AC   | 1.52 ms |
| Return Home                | 0                | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | x           | Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed. | 1.52 ms |
| Entry Mode Set             | 0                | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | I/D | S           | Sets cursor move direction and specifies display shift. These operations are performed during data write and read.               | 37 us   |
| Display ON/OFF             | 0                | 0   | 0   | 0   | 0   | 0   | 0   | 1   | D   | C   | B           | D=1:entire display on<br>C=1:cursor on<br>B=1:cursor position on   | 37 us   |
| Cursor or Display Shift    | 0                | 0   | 0   | 0   | 0   | 0   | 1   | S/C | R/L | x   | x           | Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.                                 | 37 us   |
| Function Set               | 0                | 0   | 0   | 0   | 0   | 1   | DL  | N   | F   | x   | x           | DL:interface data is 8/4 bits<br>N:number of line is 2/1<br>F:font size is 5x11/5x8  | 37 us   |
| Set CGRAM address          | 0                | 0   | 0   | 1   | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 |             | Set CGRAM address in address counter   | 37 us   |
| Set DDRAM address          | 0                | 0   | 1   | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 |             | Set DDRAM address in address counter   | 37 us   |
| Read Busy flag and address | 0                | 1   | BF  | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 |             | Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.           | 0 us    |
| Write data to RAM          | 1                | 0   | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  |             | Write data into internal RAM (DDRAM/CGRAM)   | 37 us   |
| Read data from RAM         | 1                | 1   | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  |             | Read data from internal RAM (DDRAM/CGRAM)  | 37 us   |

**Note:**

Be sure the ST7066U is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.

---

## Reset Function

### Initializing by Internal Reset Circuit

An internal reset circuit automatically initializes the IC when the power is turned on. The following instructions are executed during the initialization. The busy flag (BF) is kept in the busy state until the initialization ends (BF = 1). The busy state lasts for 40 ms after VCC rises to 4.5 V.

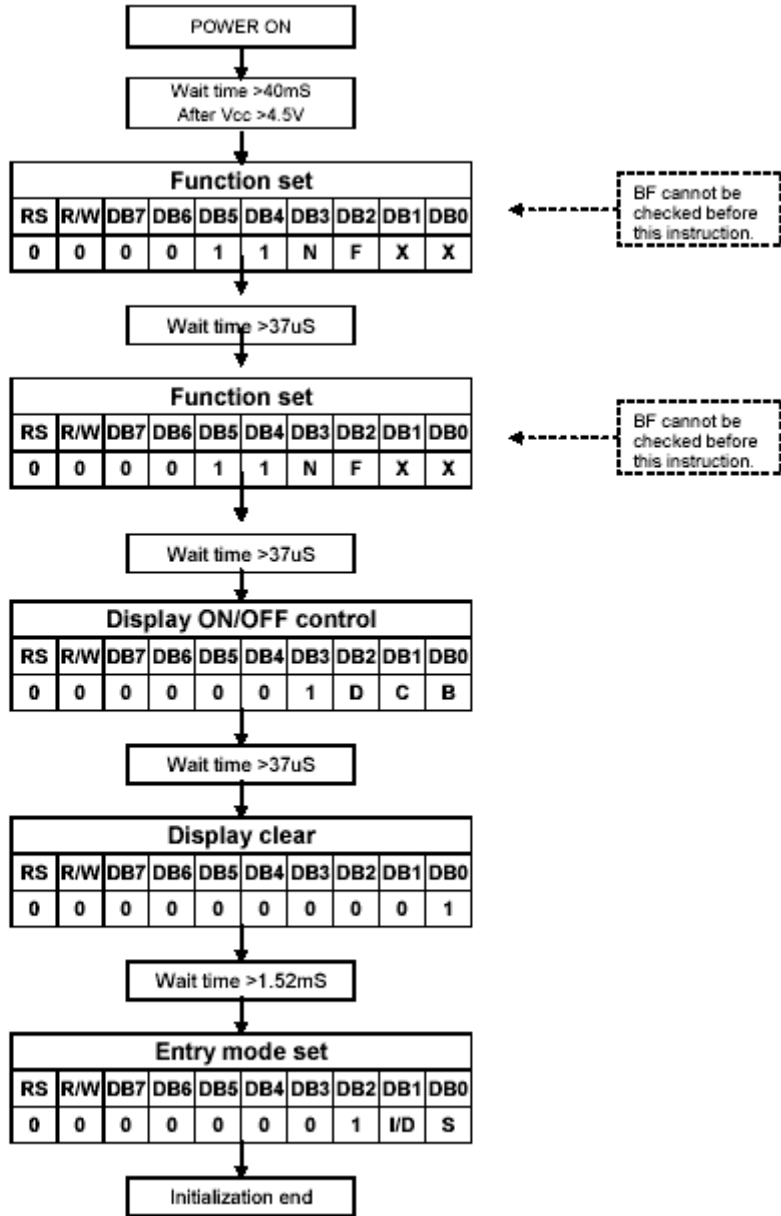
1. Display clear
2. Function set:
  - DL = 1; 8-bit interface data
  - N = 0; 1-line display
  - F = 0; 5x8 dot character font
3. Display on/off control:
  - D = 0; Display off
  - C = 0; Cursor off
  - B = 0; Blinking off
4. Entry mode set:
  - I/D = 1; Increment by 1
  - S = 0; No shift

#### Note:

If the electrical characteristics conditions listed in the table Power Supply Conditions are not met, the internal reset circuit will not operate normally and will fail to initialize the IC. For such a case, initialization must be performed by the MPU as explain by the following figures.

## Initializing by Instruction

8 bit Interface( fosc =270KHZ)



## DD RAM ADDRESSING

### For 10\*4 Display

|           |    |    |    |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|----|----|
|           | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| Character | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| DD RAM    | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 |
| Address   | 0A | 0B | 0C | 0D | 0E | 0F | 10 | 11 | 12 | 13 |
|           | 5A | 5B | 5C | 5D | 5E | 5F | 50 | 51 | 52 | 53 |

### For 16\*1 Display

|           |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Character | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| DD RAM    | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
| Address   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

### For 16\*2 or 8\*2 Display

|           |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Character | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| DD RAM    | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 8  | 9  | 0A | 0B | 0C | 0D | 0E | 0F |
| Address   | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F |

### For 16\*4 Display

|           |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Character | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| DD RAM    | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F |
| Address   | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F |
|           | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | 1E | 1F |
|           | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 5A | 5B | 5C | 5D | 5E | 5F |

### For 20\*2 Display

|           |    |    |    |    |    |    |    |    |    |    |     |     |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|----|----|-----|-----|----|----|----|----|
| Character | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | --- | --- | 17 | 18 | 19 | 20 |
| DD RAM    | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | --- | --- | 10 | 11 | 12 | 13 |
| Address   | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | --- | --- | 50 | 51 | 52 | 53 |

### For 20\*4 Display

|                                |    |    |    |    |    |    |    |    |    |    |     |     |    |    |    |    |
|--------------------------------|----|----|----|----|----|----|----|----|----|----|-----|-----|----|----|----|----|
|                                | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | --- | --- | 17 | 18 | 19 | 20 |
| Character<br>DD RAM<br>Address | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | --- | --- | 10 | 11 | 12 | 13 |
|                                | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | --- | --- | 50 | 51 | 52 | 53 |
|                                | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | --- | --- | 24 | 25 | 26 | 27 |
|                                | 54 | 55 | 56 | 57 | 58 | 59 | 5A | 5B | 5C | 5D | --- | --- | 64 | 65 | 66 | 67 |

### For 40\*2 Display

|                                |    |    |    |    |    |    |    |    |    |    |     |     |    |    |    |    |
|--------------------------------|----|----|----|----|----|----|----|----|----|----|-----|-----|----|----|----|----|
|                                | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | --- | --- | 37 | 38 | 39 | 40 |
| Character<br>DD RAM<br>Address | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | --- | --- | 24 | 25 | 26 | 27 |
|                                | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | --- | --- | 64 | 65 | 66 | 67 |

### For 40\*4 Display

|                                |    |    |    |    |    |    |    |    |    |    |    |     |     |    |    |    |    |
|--------------------------------|----|----|----|----|----|----|----|----|----|----|----|-----|-----|----|----|----|----|
|                                | E  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | --- | --- | 37 | 38 | 39 | 40 |
| Character<br>DD RAM<br>Address | E1 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | --- | --- | 24 | 25 | 26 | 27 |
|                                |    | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | --- | --- | 64 | 65 | 66 | 67 |
|                                | E2 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | --- | --- | 24 | 25 | 26 | 27 |
|                                |    | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | --- | --- | 64 | 65 | 66 | 67 |

# SUNLIKE DISPLAY

Model No: SC0802E

## CG RAM MAPPING

| Character Code<br>(DD RAM data) |   |   |   |     |   |   |   | CG RAM Address |   |   |     |   |   | Character Patterns<br>(CG RAM data)   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
|---------------------------------|---|---|---|-----|---|---|---|----------------|---|---|-----|---|---|---|---|---|---|-----|---|---|---|-------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--------|
| 7                               | 6 | 5 | 4 | 3   | 2 | 1 | 0 | 5              | 4 | 3 | 2   | 1 | 0 | 7   | 6 | 5 | 4 | 3   | 2 | 1 | 0 |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| High                            |   |   |   | Low |   |   |   | High           |   |   | Low |   |   | High  |   |   |   | Low |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0 0 0 0 * 0 0 0                 |   |   |   |     |   |   |   | 0 0 0          |   |   |     |   |   | * * *   |   |   |   |     |   |   |   | Character Pattern |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
|                                 |   |   |   |     |   |   |   |                |   |   |     |   |   | <table border="1"> <tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table> |   |   |   |     |   |   |   | 0                 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Cursor |
| 0                               | 1 | 1 | 0 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 0 | 1 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0                               | 0 | 1 | 0 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0                               | 1 | 0 | 0 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 1 | 1 | 1 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0                               | 0 | 0 | 0 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0                               | 0 | 0 | 0 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0                               | 0 | 0 | 0 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0 0 0 0 * 0 0 1                 |   |   |   |     |   |   |   | 0 0 1          |   |   |     |   |   | * * *   |   |   |   |     |   |   |   | Character Pattern |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
|                                 |   |   |   |     |   |   |   |                |   |   |     |   |   | <table border="1"> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table> |   |   |   |     |   |   |   | 1                 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Cursor |
| 1                               | 1 | 1 | 1 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 0 | 0 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 1 | 0 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 1 | 1 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 1 | 0 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 0 | 0 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 1 | 1 | 1 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0                               | 0 | 0 | 0 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮                 |   |   |   |     |   |   |   | ⋮ ⋮ ⋮ ⋮ ⋮ ⋮    |   |   |     |   |   | ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0 0 0 0 * 1 1 1                 |   |   |   |     |   |   |   | 1 1 1          |   |   |     |   |   | * * *   |   |   |   |     |   |   |   | Character Pattern |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
|                                 |   |   |   |     |   |   |   |                |   |   |     |   |   | <table border="1"> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table> |   |   |   |     |   |   |   | 1                 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Cursor |
| 1                               | 1 | 1 | 1 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 0 | 0 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 1 | 1 | 0 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 0 | 0 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 1 | 1 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 0 | 0 | 0 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 1                               | 1 | 1 | 1 | 1   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |
| 0                               | 0 | 0 | 0 | 0   |   |   |   |                |   |   |     |   |   |   |   |   |   |     |   |   |   |                   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |        |



CHARACTER FONT TABLE

| Upper<br>4 bit<br>Lower<br>4 bit | LLLL | LLLH | LLHL | LLHH | LHLL | LHLH | LHHL | LHHH | HLLL | HLLH | HLHL | HLHH | HHLL | HHLH | HHHL | HHHH |
|----------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| LLLL                             |      |      |      | 0    | 1    | 2    | 3    | 4    |      |      |      |      | 一    | 夕    | 三    | 四    |
| LLLH                             |      |      | !    | 1    | A    | Q    | 3    | 4    |      |      | 。    | ア    | チ    | △    | 当    | 夕    |
| LLHL                             |      |      | "    | 2    | B    | R    | 6    | 7    |      |      | 「    | イ    | ウ    | ×    | 目    | 目    |
| LLHH                             |      |      | #    | 3    | D    | S    | 5    | 6    |      |      | 」    | ウ    | テ    | 毛    | 三    | 夕    |
| LHLL                             |      |      | \$   | 4    | D    | T    | d    | t    |      |      | 、    | 工    | ト    | カ    | 目    | 夕    |
| LHLH                             |      |      | %    | 5    | E    | U    | 8    | U    |      |      | ・    | オ    | 大    | 工    | 目    | 夕    |
| LHHL                             |      |      | &    | 6    | F    | V    | f    | v    |      |      | ヲ    | カ    | ニ    | 目    | 目    | 夕    |
| LHHH                             |      |      | '    | 7    | G    | W    | 9    | W    |      |      | マ    | キ    | 又    | 夕    | 夕    | 夕    |
| HLLL                             |      |      | (    | 8    | H    | X    | h    | x    |      |      | 、    | ウ    | キ    | 夕    | 夕    | 夕    |
| HLLH                             |      |      | )    | 9    | I    | Y    | i    | y    |      |      | ウ    | テ    | 夕    | 夕    | 夕    | 夕    |
| HLHL                             |      |      | *    | 0    | J    | Z    | j    | z    |      |      | キ    | コ    | 夕    | 夕    | 夕    | 夕    |
| HLHH                             |      |      | +    | 1    | K    | R    | k    | r    |      |      | キ    | サ    | 目    | 目    | 夕    | 夕    |
| HHLL                             |      |      | ,    | 2    | L    | X    | l    | x    |      |      | カ    | 夕    | 夕    | 夕    | 夕    | 夕    |
| HHLH                             |      |      | -    | 3    | M    | J    | m    | j    |      |      | キ    | 又    | 夕    | 夕    | 夕    | 夕    |
| HHHL                             |      |      | .    | 4    | N    | X    | n    | x    |      |      | キ    | セ    | 夕    | 夕    | 夕    | 夕    |
| HHHH                             |      |      | /    | 5    | O    | L    | o    | l    |      |      | キ    | 夕    | 夕    | 夕    | 夕    | 夕    |