



# Wincom Tech CO., LTD.

**The LCD(M) Specialist**

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PART NO. : WC0802D  
-SFYLYHTC06

FOR MESSRS. : \_\_\_\_\_

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ACCEPTED BY: \_\_\_\_\_

PROPOSED BY: \_\_\_\_\_

## RECORD OF REVISION

| DATE | PAGE | SUMMARY |
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|      |      |         |

### **3. General specifications**

#### **3.1 General specifications**

PLEASE REFER TO:

“CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (MS-10-10000)”.

#### **3.2 Quality Assurance and Warranty**

PLEASE REFER TO:

“QUALITY ASSURANCE MANUL (MS-10-10001)“.

#### **3.3 This individual specification is prior to general specifications**

### **4. Mechanical data**

- Display format: 8 characters x 2 line
- LCD type: STN Positive, Yellow-green, Transflective
- Backlight color: LED, Yellow-Green
- Viewing angle: 6 : 00
- Data transfer: 8Bit Parallel
- LCD controller: S6A0069
- Module size: 40 x 35.4 mm
- View area: 30.4x13.9 mm
- Dot size: 0.60 x 0.60 mm
- Driving method: 1/16 duty, 1/5 bias

## 5. Absolute maximum ratings

### 5.1 Electrical absolute maximum ratings

| <i>I T E M</i>                 | <i>SYMBOL</i>                    | <i>MIN.</i> | <i>MAX.</i> | <i>UNIT</i>      | <i>COMMENT</i> |
|--------------------------------|----------------------------------|-------------|-------------|------------------|----------------|
| POWER SUPPLY FOR LOGIC         | V <sub>DD</sub> -V <sub>SS</sub> | -0.3        | 6           | V                | -----          |
| STATIC ELECTRICITY             | -----                            | -----       | -----       | V                | --             |
| POWER SUPPLY FOR BACKLIGHT     | V <sub>S</sub>                   | 0           | 4.3         | V <sub>rms</sub> | -----          |
|                                | f <sub>FL</sub>                  | -----       | -----       | KHz              | -----          |
| STARTING VOLTAGE FOR BACKLIGHT | -----                            | -----       | -----       | V <sub>rms</sub> | Ta = 25℃       |
|                                | -----                            | -----       | -----       | V <sub>rms</sub> | Ta = 25℃       |

### 5.2 Environmental absolute maximum ratings

| <i>I T E M</i>        | <i>OPERATING</i> |             | <i>STORAGE</i> |             | <i>COMMENT</i>                              |
|-----------------------|------------------|-------------|----------------|-------------|---------------------------------------------|
|                       | <i>MIN.</i>      | <i>MAX.</i> | <i>MIN.</i>    | <i>MAX.</i> |                                             |
| AMBIENT TEMPERATURE   | -20℃             | 70℃         | -30℃           | 80℃         | -----                                       |
| HUMIDITY              | NOTE (2)         |             | NOTE (2)       |             | NO CONDENSATION                             |
| VIBRATION<br>NOTE (3) | -----            | 0.5G        | -----          | 2G          | 10~300Hz<br>XYZ<br>DIRECTIONS<br>1 Hr EACH  |
| SHOCK<br>NOTE (3)     | -----            | 3G          | -----          | 5G          | 10 msec<br>XYZ<br>DIRECTIONS<br>1 TIME EACH |
| CORROSIVE GAS         | NOT ACCEPTABLE   |             | NOT ACCEPTABLE |             | -----                                       |

NOTE (2): Ta ≦ 70℃: 75% RH MAX.

Ta > 70℃: ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 75% RH AT 70℃.

NOTE (3): 1G = 9.8 m/s<sup>2</sup>

## 6. Electrical characteristics

Ta = 25°C VDD = 5.0 V

| <i>I T E M</i>                     | <i>SYMBOL</i> | <i>CONDITION</i>           | <i>MIN.</i> | <i>TYP.</i> | <i>MAX.</i> | <i>UNIT</i> |
|------------------------------------|---------------|----------------------------|-------------|-------------|-------------|-------------|
| Power supply voltage for circuit   | VDD-VSS       | -----                      | 4.75        | 5.0         | 5.25        | V           |
| Power supply voltage for LCD drive | VDD-V0        | -----                      | -----       | 4.8         | -----       | V           |
| Data input voltage                 | VIH           | H LEVEL                    | 2.4         | -----       | VDD+0.3     | V           |
|                                    | VIL           | L LEVEL                    | -0.3        | -----       | 0.2VDD      | V           |
| LCD display duty ratio             | DUTY          | -----                      | -----       | 1/16        | -----       | -----       |
| LED BACKLIGHT                      | Ifp           | I mse0 plus 10% Dutg cyele |             | ---         |             | mA          |
|                                    |               | Operating voltage          | -----       | 4.1         | ----        | V           |
|                                    |               | Forward current            |             | 50          |             | mA          |
| LED Lifetime                       | -----         | VFL=4.1Vrms<br>fFL= KHz    | -----       | 100,000     | -----       | Hr          |

## 7. Optical characteristics

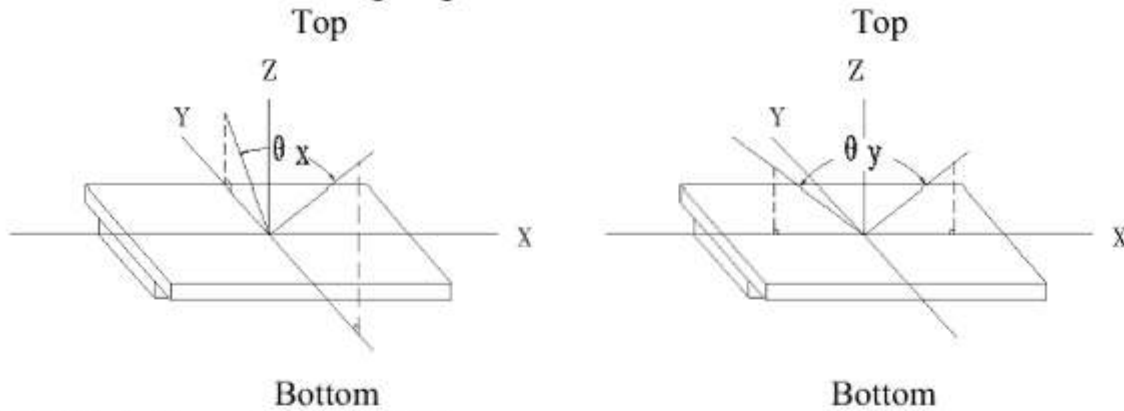
Ta = 25°C VDD-V0 = 4.8V

| <i>I T E M</i>                           | <i>SYMBOL</i> | <i>CONDITION</i>                          | <i>MIN.</i> | <i>TYP.</i> | <i>MAX.</i> | <i>UNIT</i>       | <i>NOTE</i> |
|------------------------------------------|---------------|-------------------------------------------|-------------|-------------|-------------|-------------------|-------------|
| Viewing angle                            | Φ2-Φ1         | K ≥ 2.0                                   | -35         | ----        | 20          | deg.              | 1           |
| Contrast ratio                           | K             | Φ = 10 <sup>0</sup><br>θ = 0 <sup>0</sup> | 4.0         | ----        | -----       | -----             | 1           |
| Response time<br>(at 25°C)               | tr (rise)     | Φ = 10 <sup>0</sup><br>θ = 0 <sup>0</sup> | -----       | ----        | 250         | ms                | 1           |
|                                          | tf (fall)     | Φ = 10 <sup>0</sup><br>θ = 0 <sup>0</sup> | -----       | ----        | 250         | ms                | 1           |
| The brightness<br>of backlighting source | B             | VFL=4.1Vrms<br>fFL= KHZ                   | -----       | 150         | -----       | cd/m <sup>2</sup> | 2           |

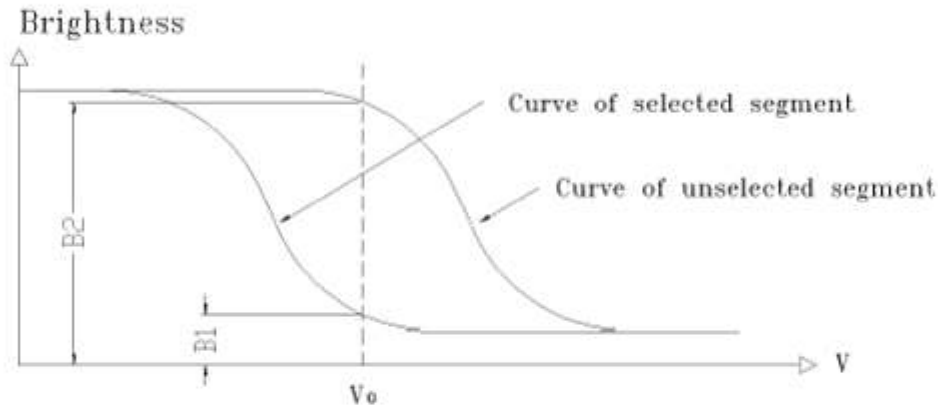
NOTE (1): SEE CUSTOMER ACCEPTANCE STANDARD SPECIFICATION FOR DEFINITION OF OPTICAL CHARACTERISTICS

NOTE (2): UNDER NORMAL TEMPERATURE AND HUMIDITY IN A DARK ROOM

### 7.2.1 Definition of Viewing Angle



### 7.2.2 Definition of Contrast Ratio

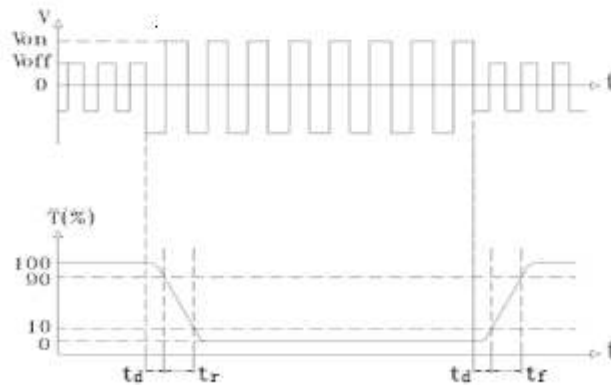


$$\text{Contrast Ratio} = B2/B1 = \frac{\text{unselected state brightness}}{\text{selected state brightness}}$$

Measuring Conditions:

- 1) Ambient Temperature: 25°C ;
- 2) Frame frequency: 64Hz

### 7.2.3 Definition of Response time

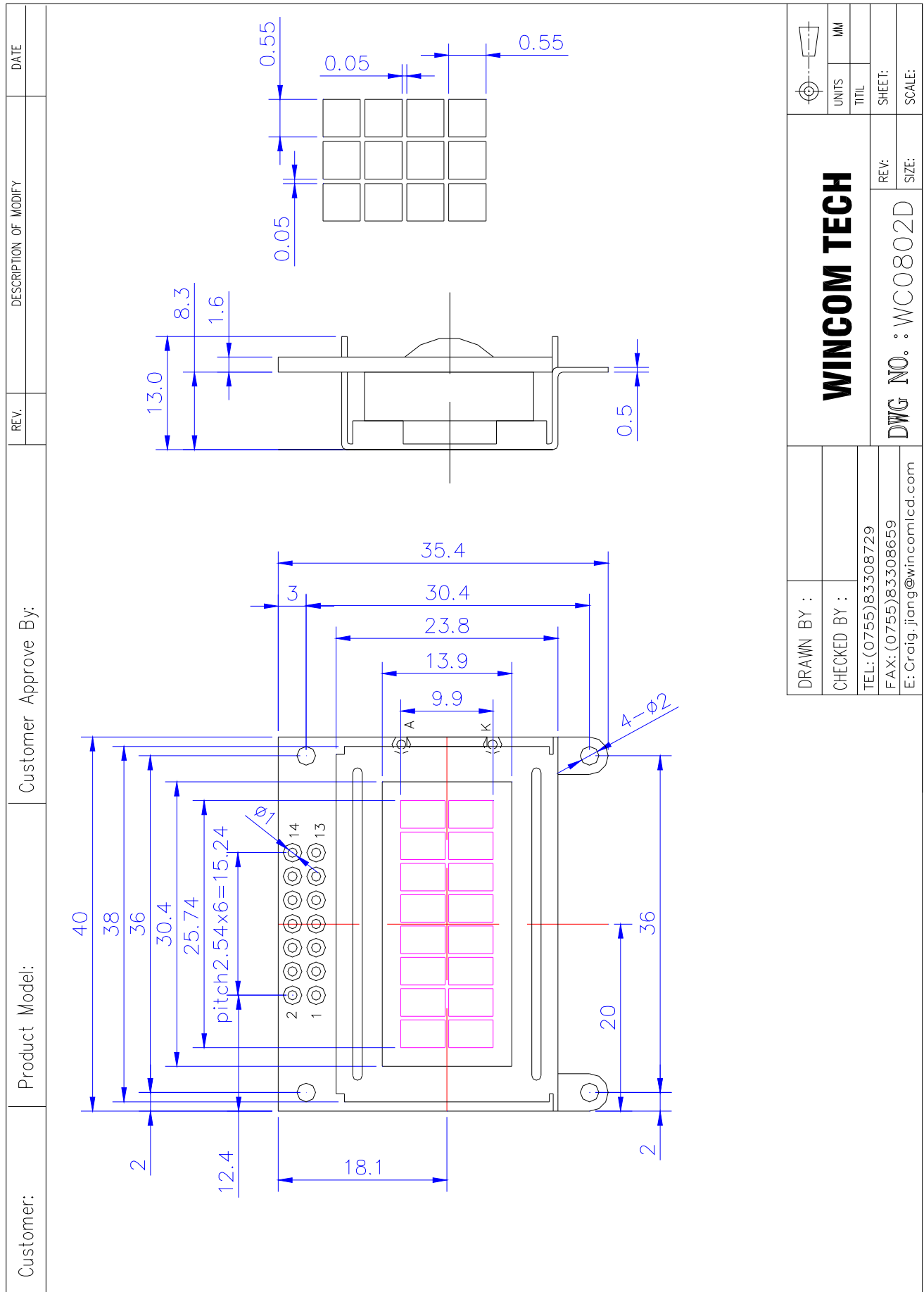


Turn on time:  $t_{on} = t_d + t_r$       Turn off time:  $t_{off} = t_d + t_r$

Measuring Condition:

- 1) Operating Voltage: 5.0V
- 2) Frame frequency: 64Hz

## 8. Outline dimension



|                                                                                     |  |              |  |                              |  |
|-------------------------------------------------------------------------------------|--|--------------|--|------------------------------|--|
|  |  | UNITS        |  | MM                           |  |
|                                                                                     |  | TITL         |  | SHEET:                       |  |
| <b>WINCOM TECH</b>                                                                  |  | REV:         |  | DWG NO. : WC0802D            |  |
|                                                                                     |  | SIZE:        |  | SCALE:                       |  |
| DRAWN BY :                                                                          |  | CHECKED BY : |  | TEL: (0755)83308729          |  |
|                                                                                     |  |              |  | FAX: (0755)83308659          |  |
|                                                                                     |  |              |  | E: Craig.jiang@wincomlcd.com |  |

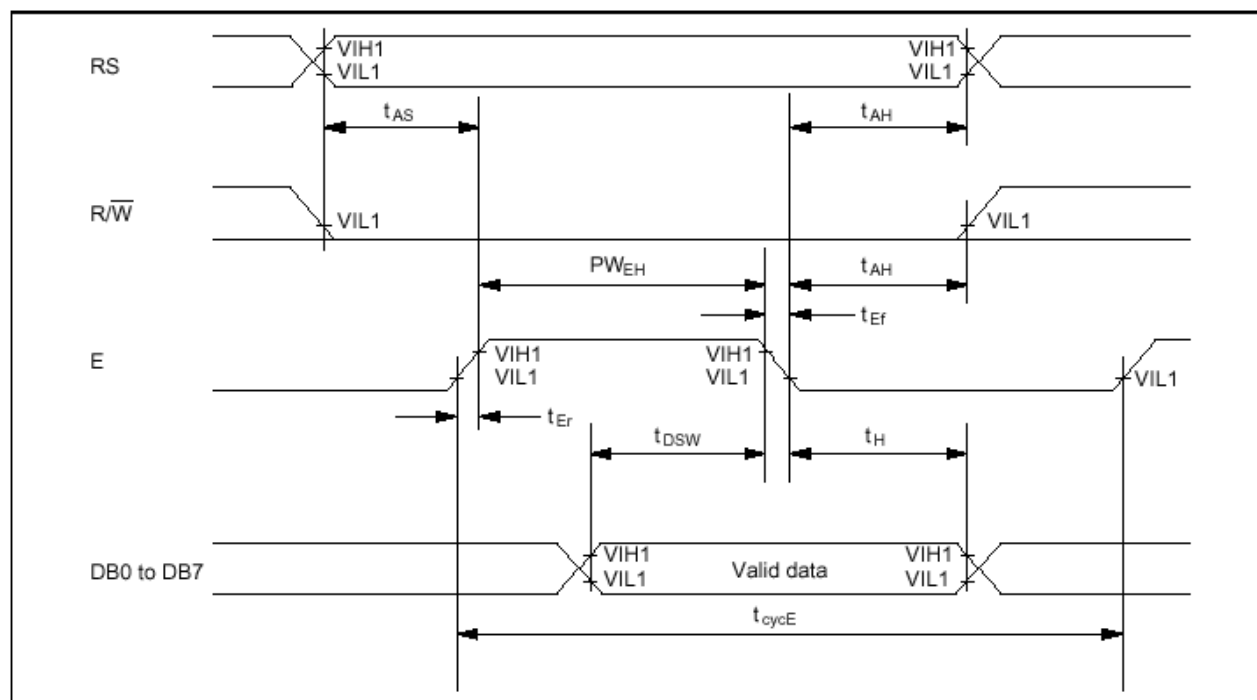


### 10.Interface Timing Chart

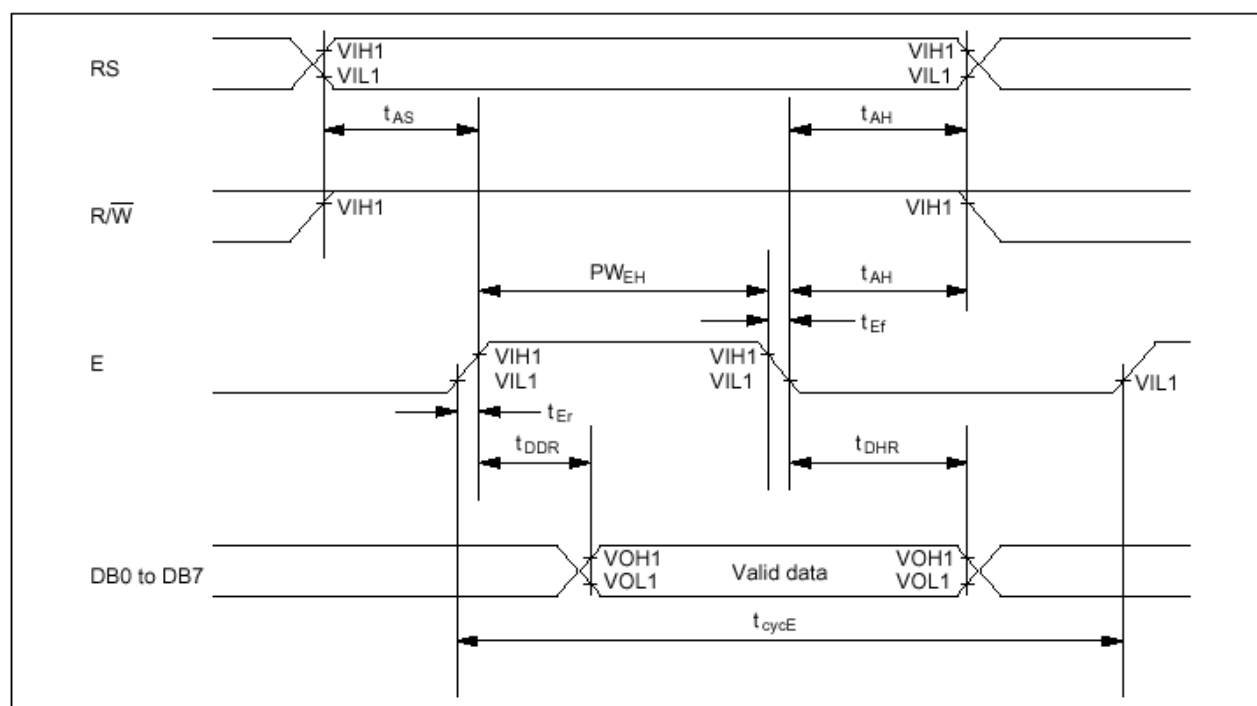
AC Characteristics( $V_{DD}=4.5V\sim 5.5V$ ,  $T_a=-30\sim +85^{\circ}C$  )

| Mode                           | Characteristic            | Symbol     | Min. | Typ. | Max. | Unit |
|--------------------------------|---------------------------|------------|------|------|------|------|
| Write Mode<br>(Refer to Fig-6) | E Cycle Time              | $t_c$      | 500  | -    | -    | ns   |
|                                | E Rise / Fall Time        | $t_R, t_F$ | -    | -    | 20   |      |
|                                | E Pulse Width (High, Low) | $t_w$      | 230  | -    | -    |      |
|                                | R/W and RS Setup Time     | $t_{su1}$  | 40   | -    | -    |      |
|                                | R/W and RS Hold Time      | $t_{H1}$   | 10   | -    | -    |      |
|                                | Data Setup Time           | $t_{su2}$  | 80   | -    | -    |      |
|                                | Data Hold Time            | $t_{H2}$   | 10   | -    | -    |      |
| Read Mode<br>(Refer to Fig-7)  | E Cycle Time              | $t_c$      | 500  | -    | -    | ns   |
|                                | E Rise / Fall Time        | $t_R, t_F$ | -    | -    | 20   |      |
|                                | E Pulse Width (High, Low) | $t_w$      | 230  | -    | -    |      |
|                                | R/W and RS Setup Time     | $t_{su}$   | 40   | -    | -    |      |
|                                | R/W and RS Hold Time      | $t_H$      | 10   | -    | -    |      |
|                                | Data Output Delay Time    | $t_D$      | -    | -    | 120  |      |
|                                | Data Hold Time            | $t_{DH}$   | 5    | -    | -    |      |

## Timing Characteristics



**Write Operation**



**Read Operation**

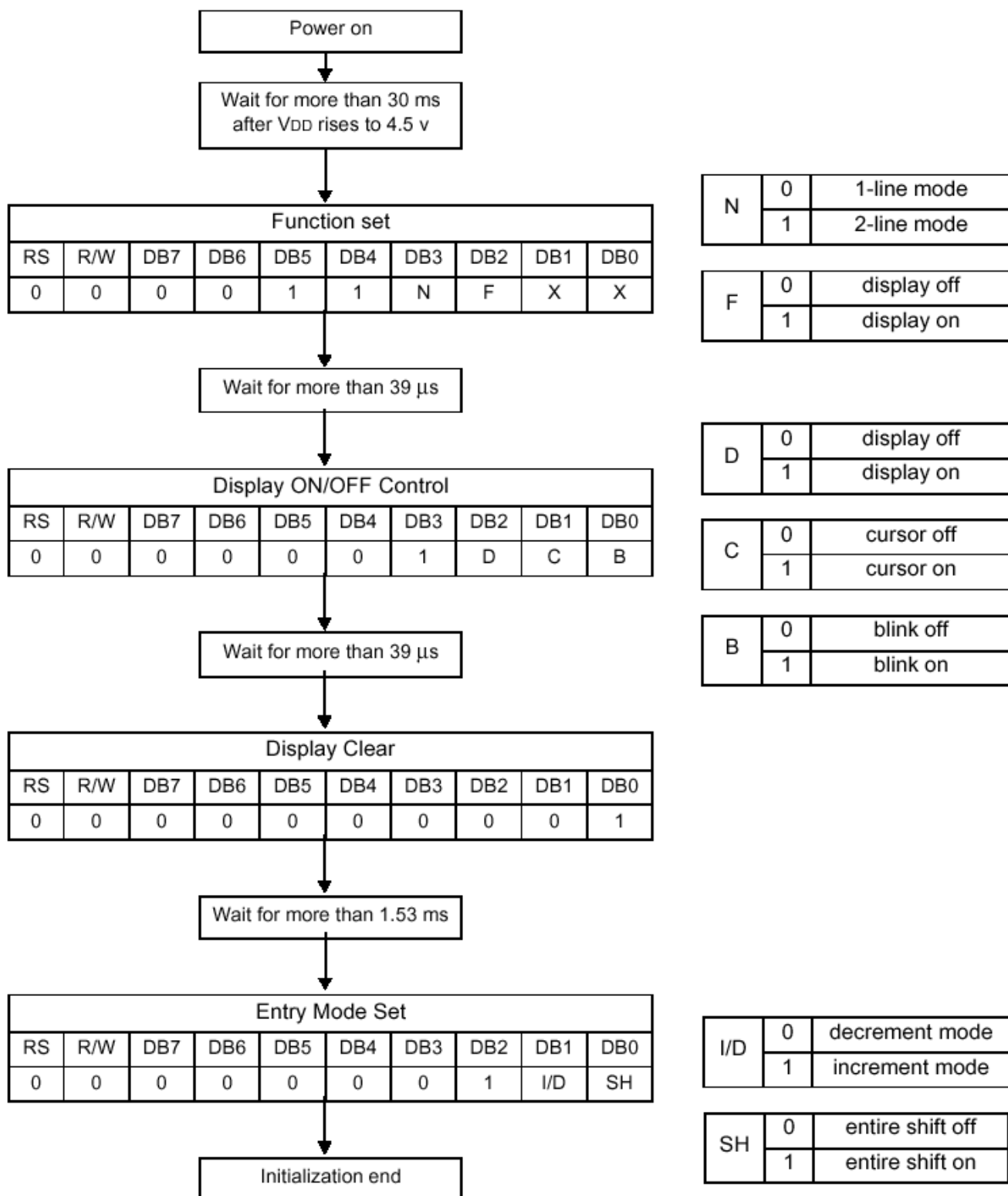
## 11. Instruction Code

**Instruction Table**

| Instruction                | Instruction Code |     |     |     |     |     |     |     |     |     | Description                                                                                                                                            | Execution time (fosc= 270 kHz) |
|----------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                            | RS               | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |                                                                                                                                                        |                                |
| Clear Display              | 0                | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | Write "20H" to DDRAM and set DDRAM address to "00H" from AC                                                                                            | 1.53 ms                        |
| Return Home                | 0                | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | -   | Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.                       | 1.53 ms                        |
| Entry Mode Set             | 0                | 0   | 0   | 0   | 0   | 0   | 0   | 1   | I/D | SH  | Assign cursor moving direction and enable the shift of entire display.                                                                                 | 39 $\mu$ s                     |
| Display ON/OFF Control     | 0                | 0   | 0   | 0   | 0   | 0   | 1   | D   | C   | B   | Set display(D), cursor(C), and blinking of cursor(B) on/off control bit.                                                                               | 39 $\mu$ s                     |
| Cursor or Display Shift    | 0                | 0   | 0   | 0   | 0   | 1   | S/C | R/L | -   | -   | Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.                                                    | 39 $\mu$ s                     |
| Function Set               | 0                | 0   | 0   | 0   | 1   | DL  | N   | F   | -   | -   | Set interface data length (DL: 8-bit/4-bit), numbers of display line (N: 2-line/1-line) and, display font type (F:5 $\times$ 11dots/5 $\times$ 8 dots) | 39 $\mu$ s                     |
| Set CGRAM Address          | 0                | 0   | 0   | 1   | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set CGRAM address in address counter.                                                                                                                  | 39 $\mu$ s                     |
| Set DDRAM Address          | 0                | 0   | 1   | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set DDRAM address in address counter.                                                                                                                  | 39 $\mu$ s                     |
| 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 $\mu$ s                      |
| Write Data to RAM          | 1                | 0   | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | Write data into internal RAM (DDRAM/CGRAM).                                                                                                            | 43 $\mu$ s                     |
| Read Data from RAM         | 1                | 1   | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  | Read data from internal RAM (DDRAM/CGRAM).                                                                                                             | 43 $\mu$ s                     |

\* "-": don't care

NOTE: When an MPU program with checking the Busy Flag(DB7) is made, it must be necessary 1/2Fosc is necessary for executing the next instruction by the falling edge of the 'E' signal after the Busy Flag (DB7) goes to "Low".



## 12.Character generator ROM

| Lower 4 Bits \ Upper 4 Bits |            | 0000 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|-----------------------------|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| xxxx0000                    | CG RAM (1) |      |      | Ø    | Q    | P    | `    | P    |      | —    | タ    | ミ    | α    | ρ    |
| xxxx0001                    | (2)        | !    | 1    | A    | Q    | a    | q    | 。    | ア    | チ    | △    |      | ä    | q    |
| xxxx0010                    | (3)        | "    | 2    | B    | R    | b    | r    | 「    | イ    | ツ    | ×    |      | β    | θ    |
| xxxx0011                    | (4)        | #    | 3    | C    | S    | c    | s    | 」    | ウ    | テ    | モ    |      | ε    | ω    |
| xxxx0100                    | (5)        | \$   | 4    | D    | T    | d    | t    | 、    | エ    | ト    | ト    |      | μ    | Ω    |
| xxxx0101                    | (6)        | %    | 5    | E    | U    | e    | u    | ・    | オ    | ナ    | 1    |      | ε    | Ü    |
| xxxx0110                    | (7)        | &    | 6    | F    | V    | f    | v    | ヲ    | カ    | ニ    | ヨ    |      | ρ    | Σ    |
| xxxx0111                    | (8)        | '    | 7    | G    | W    | g    | w    | ア    | キ    | ヌ    | ラ    |      | g    | π    |
| xxxx1000                    | (1)        | (    | 8    | H    | X    | h    | x    | イ    | ク    | ネ    | リ    |      | γ    | ×    |
| xxxx1001                    | (2)        | )    | 9    | I    | Y    | i    | y    | ウ    | ケ    | ル    |      |      | ´    | Y    |
| xxxx1010                    | (3)        | *    | :    | J    | Z    | j    | z    | エ    | コ    | ン    | レ    |      | j    | キ    |
| xxxx1011                    | (4)        | +    | ;    | K    | C    | k    | c    | オ    | サ    | ヒ    | ロ    |      | *    | 万    |
| xxxx1100                    | (5)        | ,    | <    | L    | ¥    | 1    | 1    | ヤ    | シ    | フ    | ワ    |      | Φ    | 円    |
| xxxx1101                    | (6)        | —    | =    | M    | ]    | m    | }    | ユ    | ズ    | へ    | ン    |      | も    | ÷    |
| xxxx1110                    | (7)        | .    | >    | N    | ^    | n    | →    | ヨ    | セ    | ホ    | °    |      | ñ    |      |
| xxxx1111                    | (8)        | /    | ?    | O    | _    | o    | ←    | ッ    | ソ    | マ    | °    |      | ö    | ■    |