

PRODUCT SPECIFICATION

C4004A-D-YSXFDYN-100

V1.0

April 21, 2008

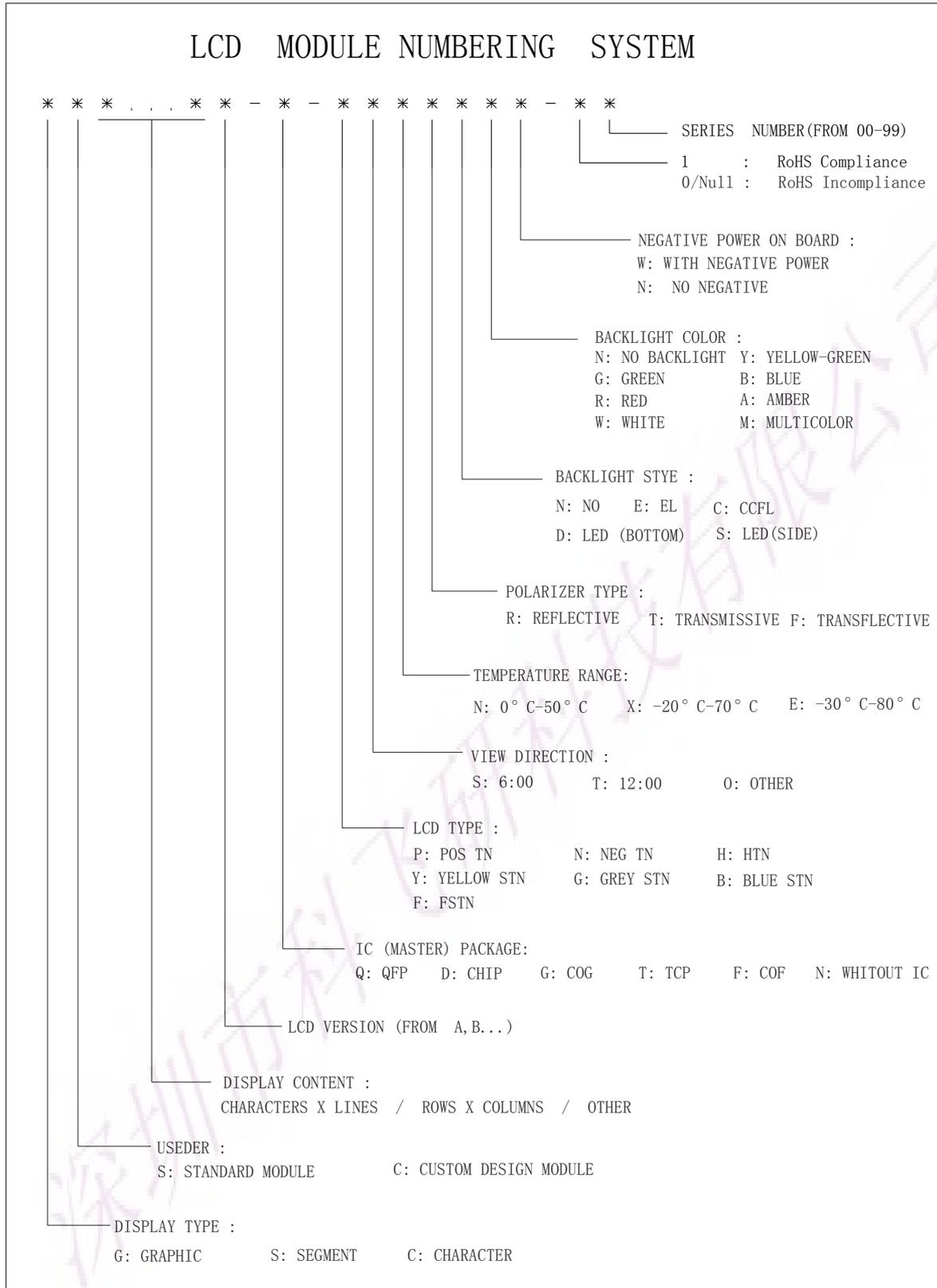
REVISION RECORD

| REV | DESCRIPTION | DATE |
|------|-------------|----------------|
| V1.0 | | April 21, 2008 |

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1. LCD Module Numbering System



2. Type Number and Description

| | |
|------------------------|---|
| Type Number: | C4004A-D-YSXFDYN-100 |
| Description: | 40 Characters x 4 Lines |
| LCD Panel: | Yellow-Green STN, Positive, Transflective |
| Duty and Bias: | 1/16 duty; 1/5 bias |
| Operating Temperature: | -20 °C – 70 °C |
| Storage Temperature: | -30 °C – 80 °C |
| Viewing angle: | 6H |
| BackLight: | Bottom, Yellow-Green LED |
| Controller: | ST7066U-0A or equivalent |
| IC Package: | Bonding |
| Logic Voltage: | 5.0V |

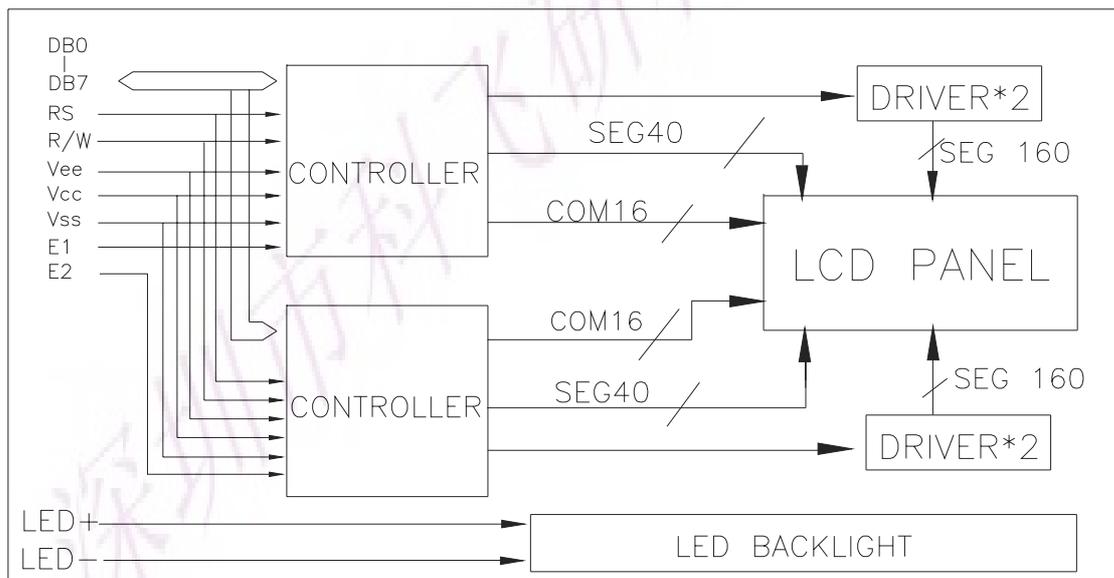
4. Electrical Block Diagram

4.1 PINS DEFINITION

| PIN | SYMBOL | FUNCTION |
|-----|---------|----------------------------------|
| 1-8 | DB7-DB0 | Data Bus Line |
| 9 | E1 | Enable Signal(UP) |
| 10 | R/W | L: Write ; H: Read |
| 11 | RS | Instruction/Data Register Select |
| 12 | Vo | Contrast Adjust |
| 13 | VSS | Power Supply(GND) |
| 14 | Vdd | Power Supply(+5V) |
| 15 | E2 | Enable Signal(DOWN) |
| 16 | NC | NO Connect |
| 17 | K | Power Supply for LED B/L(-) |
| 18 | A | Power Supply for LED B/L(+) |

17和18脚正负极可通过硬件调节进行互换，请客户在使用本产品时注意此问题！

4.2 ELECTRICAL BLOCK DIAGRAM



4.3 DISPLAY CHARACTER ADDRESS CODE

| DISPLAY POSITION | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 28 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
|------------------|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| IC1 | LINE1 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | 1E | 1F | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| DDRAM | LINE2 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 5A | 5B | 5C | 5D | 5E | 5F | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 |
| IC2 | LINE3 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | 1E | 1F | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| DDRAM | LINE4 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 5A | 5B | 5C | 5D | 5E | 5F | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 |

5. Absolute Maximum Ratings

5.1 Electrical Maximum Ratings (Ta=25deg C)

| ITEM | SYMBOL | CONDITION | MIN | MAX | UNIT |
|----------------------------|-----------|-----------|------|----------|------|
| Supply Voltage (Logic) | Vdd – Vss | - | 0 | 7.0 | V |
| Supply Voltage (LCD Drive) | Vdd – V0 | - | 0 | 11.5 | V |
| Input Voltage | Vi | - | -0.3 | Vdd +0.3 | V |

5.2 Environmental Conditions

| ITEM | SYMBOL | CONDITION | MIN | MAX | UNIT |
|--------------------|--------|--------------------------------|---------------|-----|-------|
| Operating Temp | Topr | - | -20 | 70 | deg C |
| Storage Temp | Ttsg | - | -30 | 80 | deg C |
| Humidity Endurance | RH | no condensation Ta</=40 deg | - | 95 | % |
| Vibration | - | 3 directions | see note (a) | | - |
| Shock | - | 3 directions | see note (b) | | - |

note (a): frequency : varying from 10 Hz in a 1-minute cycle

amplitude : 1.5mm

duration : 120 cycles, each lasting 1 minute,

for each of the 3 directions, x,y,z

note (b): mutually perpendicular directions

direction normal to surface of LCD glass

80G, half-sine pulse of duration 11ms

other 2 directions

100G, half-sine pulse of duration 11ms

6. Electrical Specifications

6.1 Electrical Characteristics at $T_a=25$ deg C, $V_{dd} = 5V + / - 5\%$

| ITEM | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT |
|---|--------------|---------------|------|------|----------|------|
| Supply Voltage (logic) | $V_{dd}-V_s$ | - | 4.5 | 5.0 | 5.5 | V |
| Supply Voltage (LCD) | $V_{dd}-V_0$ | $V_{dd} = 5V$ | 4.5 | 4.7 | 4.9 | V |
| Input signal voltage (for E, DB0-7,R/W,RS) | V-ih | “H” level | 2.2 | - | V_{dd} | V |
| | V-il | “L” level | 0 | - | 0.6 | V |
| Supply Current (logic) | I_{cc} | - | - | 1 | 1.2 | mA |
| Supply Current (LCD) | I_o | - | 0.15 | 0.22 | 0.27 | mA |
| Supply Voltage (LED) | V-bl | - | 4.0 | 4.2 | 4.5 | V |
| Supply Current (LED) | I-bl | - | - | 500 | 1000 | mA |

6.2 Timing Specifications at $T_a = 25$ deg C, $V_{dd} = 5V \pm 10\%$, $V_{ss} = 0V$

6.2.1 Write mode

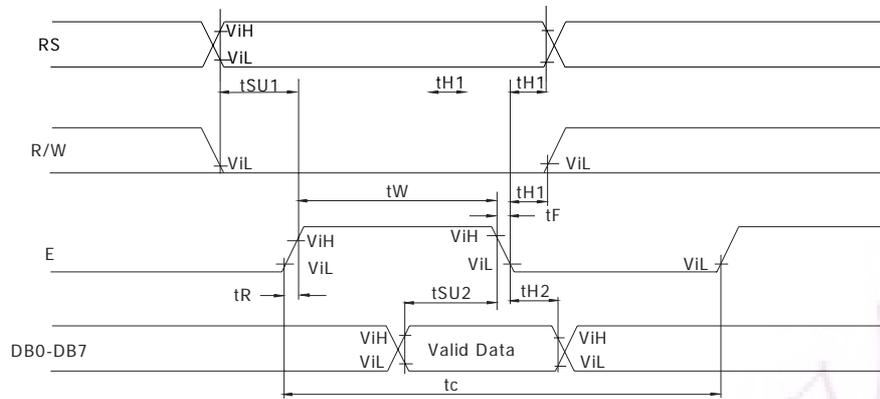
| ITEM | SYMBOL | MIN | MAX | UNIT |
|------------------------|-----------|------|-----|------|
| E cycle time | t_c | 1200 | - | ns |
| E rise time | t_R | - | 25 | ns |
| E fall time | t_F | - | 25 | ns |
| E-pulse width (H, L) | t_w | 140 | - | ns |
| R/W and RS set-up time | t_{sul} | 0 | - | ns |
| R/W and RS hold time | t_{H1} | 10 | - | ns |
| Data set-up time | t_{su2} | 40 | - | ns |
| Data hold time | t_{H2} | 10 | - | ns |

6.2.2 Read mode

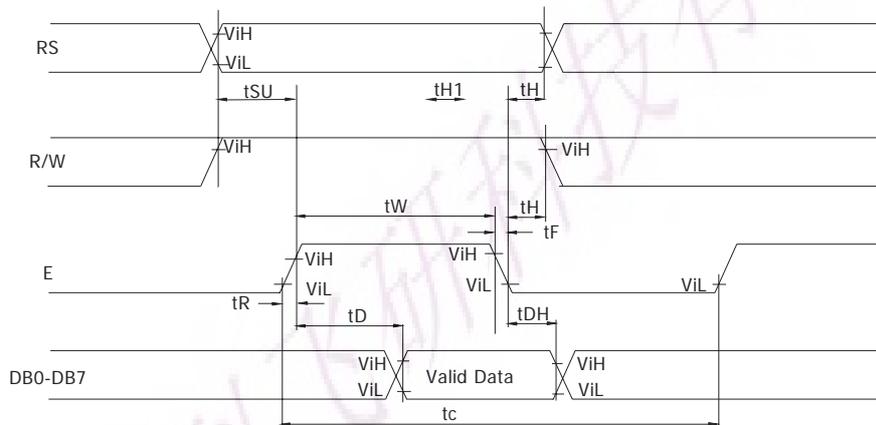
| ITEM | SYMBOL | MIN | MAX | UNIT |
|------------------------|----------|------|-----|------|
| E cycle time | t_c | 1200 | - | ns |
| E rise time | t_R | - | 25 | ns |
| E fall time | t_F | - | 25 | ns |
| E-pulse width (H, L) | t_w | 140 | - | ns |
| R/W and RS set-up time | t_{su} | 0 | - | ns |
| R/W and RS hold time | t_H | 10 | - | ns |
| Data output delay | t_D | - | 100 | ns |
| Data hold time | t_{DH} | 10 | - | ns |

6.2.3 Timing Diagram

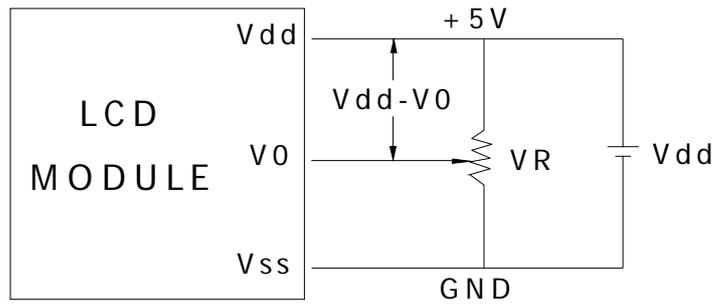
WRITE MODE TIMING DIAGRAM



READ MODE TIMING DIAGRAM



7. Power Supply for LCD Module



Vdd-V0: LCD Driving Voltage
VR: 10K - 20K

8. Electro-Optical Characteristic

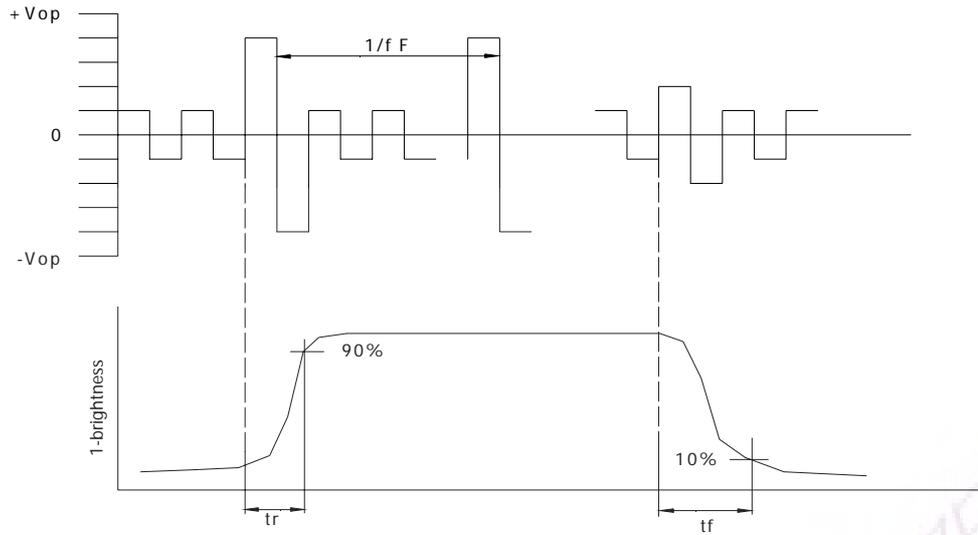
| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | REF. |
|-----------------|--------------------------------|-----------|------|------|------|------|--------|
| Contrast | CR | 25°C | -- | 12 | -- | | note 1 |
| Rise Time | tr | 25°C | -- | 160 | 240 | ms | note 2 |
| Fall Time | tf | 25°C | -- | 100 | 150 | ms | note 2 |
| Viewing Angle | $\theta 1 - \theta 2$ | 25°C | -- | -- | 60 | DEG | note 3 |
| | $\varnothing 1, \varnothing 2$ | | -40 | -- | 40 | | |
| Frame Frequency | Ff | 25°C | -- | 64 | -- | Hz | note 2 |

Note(1): Contrast ratio is defined under the following condition:

$$CR = \frac{\text{brightness of non-selected condition}}{\text{brightness of selected condition}}$$

- Temperature-----25C
- Frame Frequency-----64Hz
- Viewing angle----- $\theta = 0, \varnothing = 0$
- Operating Voltage---4.7V

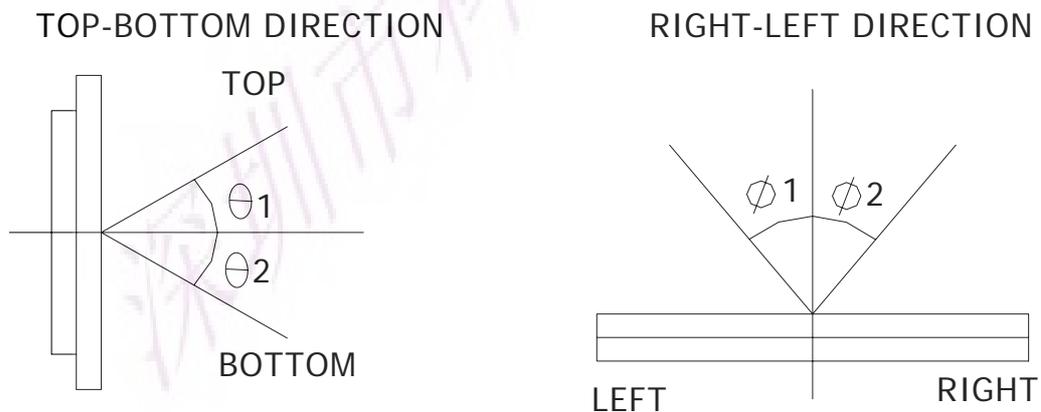
Note(2): definition of response time:



Condition:

- (a). Temperature-----25C
- (b). Frame Frequency-----64Hz
- (c). Viewing angle----- $\theta = 0, \varnothing = 0$
- (d). Operating Voltage---4.7V

Note(3): definition of view angle:



9. Instruction Table

| Instruction | Instruction Code | | | | | | | | | | Description | Execution time (fosc=270KHz) | |
|----------------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|--|------------|
| | 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. | 1.52 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 | SH | Assign cursor moving direction and make shift of entire display enable. | 37 μ s |
| Display ON/OFF Control | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | Set display(D), cursor(C), and blinking of cursor(B) on/off control bit. | 37 μ s |
| Cursor or Display Shift | 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 μ s | |
| Function Set | 0 | 0 | 0 | 0 | 1 | DL | N | F | X | X | Set interface data length (DL : 4-bit/8-bit), numbers of display line (N : 1-line/2-line), display font type(F : 5 X 8 dots/ 5 X 11 dots) | 37 μ s | |
| Set CGRAM Address | 0 | 0 | 0 | 1 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set CGRAM address in address counter. | 37 μ s | |
| Set DDRAM Address | 0 | 0 | 1 | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set DDRAM address in address counter. | 37 μ 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 μ s | |
| Write Data to RAM | 1 | 0 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Write data into internal RAM (DDRAM/CGRAM). | 43 μ s | |
| Read Data from RAM | 1 | 1 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read data from internal RAM (DDRAM/CGRAM). | 43 μ s | |

- "X" : don't care

10. Standard character pattern

| b7-b4 b3-b0 | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|----------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0000 | CG RAM (1) | | | 0 | 8 | P | ^ | P | | | | - | 9 | 3 | 0 | P |
| 0001 | (2) | | ! | 1 | A | Q | a | 9 | | | . | 7 | 7 | G | 3 | 9 |
| 0010 | (3) | | " | 2 | B | R | b | r | | | " | 4 | 9 | X | P | 0 |
| 0011 | (4) | | # | 3 | C | S | c | s | | | ! | 9 | 7 | E | 3 | 0 |
| 0100 | (5) | | \$ | 4 | D | T | d | t | | | \ | 1 | 1 | P | P | 0 |
| 0101 | (6) | | % | 5 | E | U | e | u | | | . | 3 | 7 | 1 | 0 | 0 |
| 0110 | (7) | | & | 6 | F | V | f | v | | | 9 | 0 | 2 | 0 | P | Z |
| 0111 | (8) | | * | 7 | G | W | g | w | | | 7 | 7 | 2 | 7 | 9 | 0 |
| 1000 | (1) | | (| 8 | H | X | h | x | | | 4 | 9 | 3 | U | J | X |
| 1001 | (2) | |) | 9 | I | Y | i | y | | | 0 | 7 | 1 | U | 1 | Y |
| 1010 | (3) | | * | : | J | Z | j | z | | | = | 0 | 0 | V | J | 7 |
| 1011 | (4) | | + | ; | K | [| k | [| | | * | 9 | E | 0 | X | 0 |
| 1100 | (5) | | , | < | L |] | l |] | | | P | 9 | 7 | 7 | 0 | 0 |
| 1101 | (6) | | - | = | M | ^ | m | ^ | | | 2 | X | ^ | U | 1 | 1 |
| 1110 | (7) | | . | > | N | ~ | n | ~ | | | 3 | E | ~ | ^ | 0 | 0 |
| 1111 | (8) | | / | ? | O | _ | o | _ | | | 0 | 9 | 2 | ^ | 0 | 0 |

11. Precaution For Using LCM

1. LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The following precautions should be taken when handling,

- (1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.
- (2). Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface. Wipe gently with cotton. Chamois or other soft material soaked in petroleum benzin.
- (3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.
- (4). Glass can be easily chipped or cracked from rough handling, especially at corners and edges.
- (5). Do not drive LCD with DC voltage.

2. Liquid Crystal Display Modules

2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

- (1). Do not tamper in any way with the tabs on the tabs on the metal frame.
- (2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.
- (3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).
- (4). When mounting a LCM make sure that the PCB is not under any tress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
- (5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

2.2. Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

- (1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, the copper leads on the PCB and the interface terminals with any parts of the human body.
- (2). The modules should be kept in antistatic bags or other containers resistant to static for storage.
- (3). Only properly grounded soldering irons should

be used.

- (4). If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
- (5). The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.
- (6). Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

2.3. Soldering

- (1). Solder only to the I/O terminals.
- (2). Use only soldering irons with proper grounding and no leakage.
- (3). Soldering temperature: $280\text{ }^{\circ}\text{C} \pm 10^{\circ}\text{C}$
- (4). Soldering time: 3 to 4 sec.
- (5). Use eutectic solder with resin flux fill.
- (6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

2.4. Operation

- (1). The viewing angle can be adjusted by varying the LCD driving voltage V_0 .
- (2). Driving voltage should be kept within specified range; excess voltage shortens display life.
- (3). Response time increases with decrease in temperature.
- (4). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".
- (5). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

2.5. Storage

If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

2.6. Limited Warranty

Unless otherwise agreed between EASTERNTRONIC and customer, EASTERNTRONIC will replace or repair any of its LCD and LC, which is found to be defective electrically and visually when inspected in accordance with EASTERNTRONIC acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of EASTERNTRONIC is limited to repair and/or replacement on the terms set forth above. EASTERNTRONIC will not responsible for any subsequent or consequential events.

