

NHD-0108FZ-FL-YBW-3V-C1

Character Liquid Crystal Display Module

| | |
|-------|--|
| NHD- | Newhaven Display |
| 0108- | 1 line x 8 characters |
| FZ- | Model |
| F- | Transflective |
| L- | Yellow/Green LED Backlight |
| Y- | STN- Yellow/Green |
| B- | 6:00 view |
| W- | Wide Temperature (-20°C~+70°C) |
| 3V- | 3 VDD |
| C1- | 16-pin header, Samtec PN: TSW-116-18-T-S or equivalent soldered to component side of PC board |

RoHS Compliant

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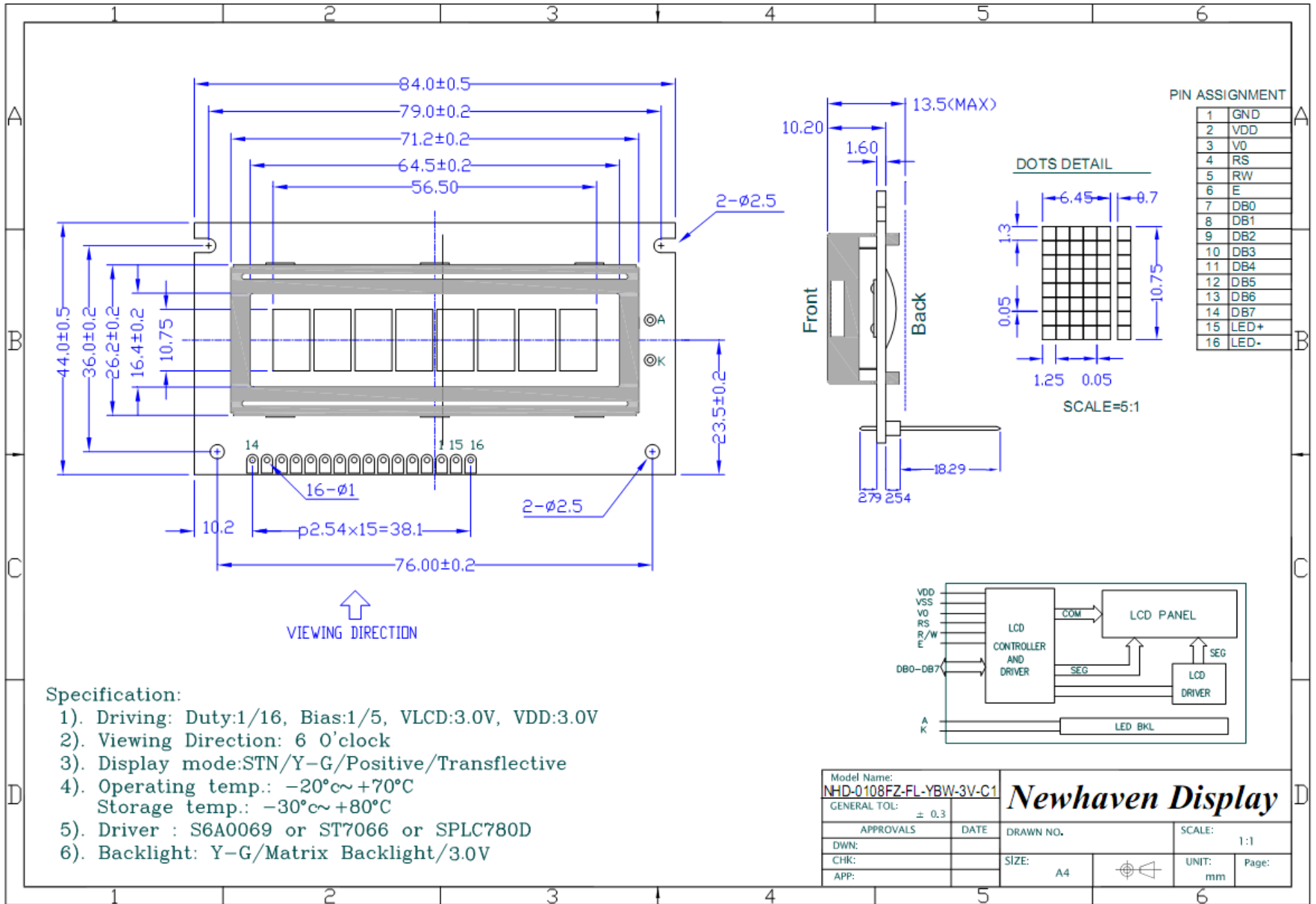
Document Revision History

| Revision | Date | Description | Changed by |
|----------|------------|-----------------------------------|------------|
| 0 | 5/13/2006 | Initial Release | - |
| 1 | 10/7/2009 | User Guide Reformat | BE |
| 2 | 11/20/2009 | Optical/Backlight current revised | BE |
| | | | |

Functions and Features

- 1 line x 8 characters
- Built-in controller (SPLC780D or equivalent)
- +3.0V power supply
- 1/16 duty, 1/5 bias
- RoHS compliant

Mechanical Drawing



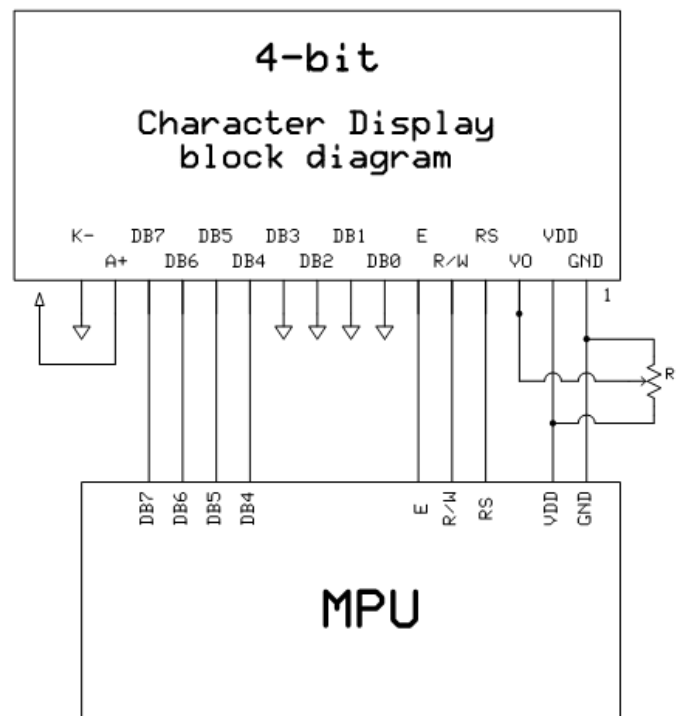
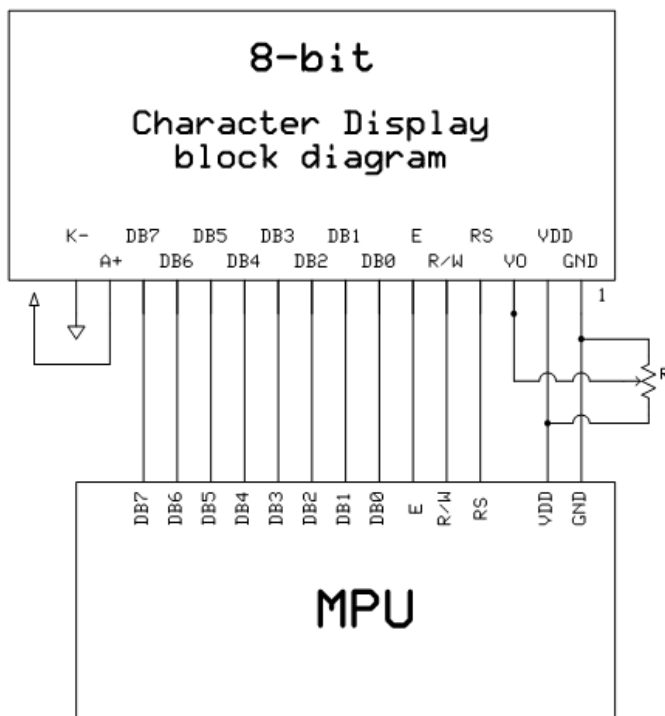
| | | | |
|---|------|-------------------------|------------|
| Model Name: NHD-0108FZ-FL-YBW-3V-C1 | | Newhaven Display | |
| GENERAL TOL: ± 0.3 | | | |
| APPROVALS | DATE | DRAWN NO. | SCALE: 1:1 |
| DWN: | | SIZE: A4 | UNIT: mm |
| CHK: | | | Page: |
| APP: | | | |

Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---------|-----------|---------------------|---|
| 1 | VSS | Power Supply | Ground |
| 2 | VDD | Power Supply | Supply Voltage for logic (+3.0V) |
| 3 | V0 | Adj Power Supply | Power supply for contrast (approx. 0V) |
| 4 | RS | MPU | Register select signal. RS=0: Command, RS=1: Data |
| 5 | R/W | MPU | Read/Write select signal, R/W=1: Read R/W: =0: Write |
| 6 | E | MPU | Operation enable signal. Falling edge triggered. |
| 7-10 | DB0 – DB3 | MPU | Four low order bi-directional three-state data bus lines. These four are not used during 4-bit operation. |
| 11-14 | DB4 – DB7 | MPU | Four high order bi-directional three-state data bus lines. |
| 15 | LED+ | Power Supply | Power Supply for LED Backlight (+3.0V) |
| 16 | LED- | Power Supply | Ground for Backlight |

LCD connector: Samtec PN: TSW-116-18-T-S or equivalent soldered to component side of PC board

Backlight connector: --- **Mates with:** ---



Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|--------|-------------------|------|------|------|------|
| Operating Temperature Range | Top | Absolute Max | -20 | - | +70 | °C |
| Storage Temperature Range | Tst | Absolute Max | -30 | - | +80 | °C |
| Supply Voltage | VDD | | 2.7 | 3.0 | 3.3 | V |
| Supply Current | IDD | Ta=25°C, VDD=3.0V | - | 1.5 | 2.5 | mA |
| Supply for LCD (contrast) | VDD-V0 | Ta=25°C | - | 3.0 | - | V |
| "H" Level input | Vih | | 2.2 | - | VDD | V |
| "L" Level input | Vil | | 0 | - | 0.6 | V |
| "H" Level output | Voh | | 2.4 | - | - | V |
| "L" Level output | Vol | | - | - | 0.4 | V |
| | | | | | | |
| Backlight Supply Voltage | Vled | - | - | 3.0 | - | V |
| Backlight Supply Current | Iled | Vled=3.0V | - | 120 | 140 | mA |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------------------|--------|-----------|------|------|------|------|
| Viewing Angle - Vertical (top) | AV | Cr ≥ 2 | - | 35 | - | ° |
| Viewing Angle - Vertical (bottom) | AV | Cr ≥ 2 | - | 60 | - | ° |
| Viewing Angle - Horizontal (left) | AH | Cr ≥ 2 | - | 40 | - | ° |
| Viewing Angle - Horizontal (right) | AH | Cr ≥ 2 | - | 40 | - | ° |
| Contrast Ratio | Cr | | - | 6 | - | - |
| Response Time (rise) | Tr | - | - | 150 | 250 | ms |
| Response Time (fall) | Tf | - | - | 150 | 250 | ms |

Controller Information

Built-in S6A0069. Download specification at http://www.newhavendisplay.com/app_notes/S6A0069.pdf

Table of Commands

| 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 μs |
| 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 μs |
| 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 μs |
| 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:5×11dots/5×8 dots) | 39 μs |
| Set CGRAM Address | 0 | 0 | 0 | 1 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set CGRAM address in address counter. | 39 μs |
| Set DDRAM Address | 0 | 0 | 1 | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set DDRAM address in address counter. | 39 μs |
| 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 μs |
| Write Data to RAM | 1 | 0 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Write data into internal RAM (DDRAM/CGRAM). | 43 μs |
| Read Data from RAM | 1 | 1 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read data from internal RAM (DDRAM/CGRAM). | 43 μs |

DDRAM address:

| | | | | | | | | Display position |
|----|----|----|----|----|----|----|----|------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | DDRAM address |

Timing Characteristics

| Mode | Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|---|-------------------------------|----------------|-------|------|------|------|
| Interface Mode with Extension Driver (Refer to Fig-8) | Clock Pulse Width (High, Low) | t_c | 800 | - | - | ns |
| | Clock Rise / Fall Time | t_{R}, t_{F} | - | - | 25 | |
| | Clock Setup Time | t_{su1} | 500 | - | - | |
| | Data Setup Time | t_{su2} | 300 | - | - | |
| | Data Hold Time | t_{DH} | 300 | - | - | |
| | M Delay Time | t_{DM} | -1000 | - | 1000 | |

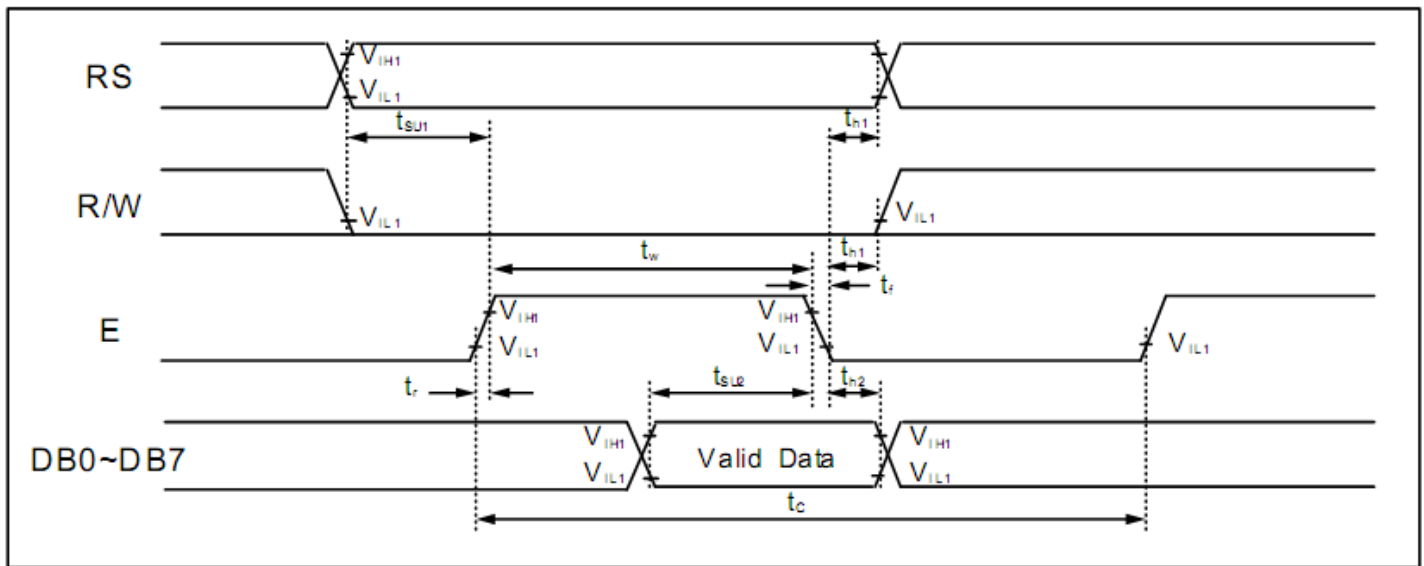


Figure 6 . Write Mode Timing Diagram

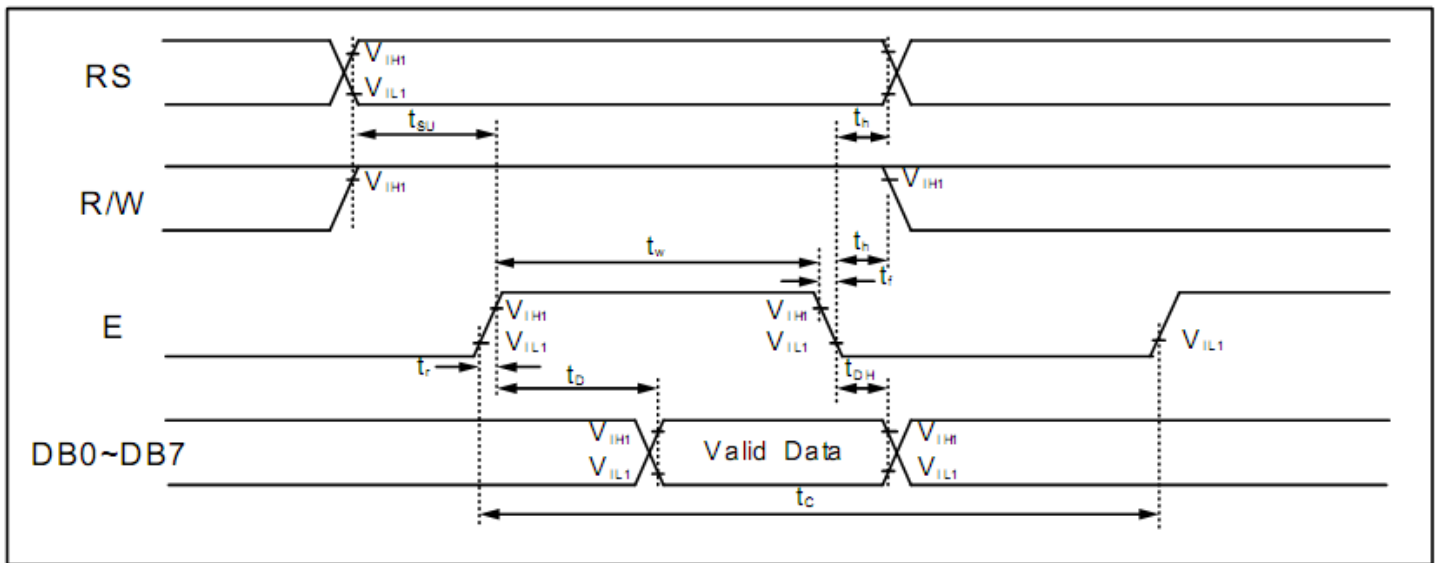


Figure 7 . Read Mode Timing Diagram

Built-in Font Table

| Lower 4 Bits | Upper 4 Bits | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|-----------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| xxxx0000 | CG RAM (1) | | | 0 | @ | P | ` | P | | | | - | 夕 | 三 | & | P | |
| xxxx0001 | (2) | | | ! | 1 | A | Q | a | q | | | 。 | ア | チ | △ | ≡ | q |
| xxxx0010 | (3) | | | " | 2 | B | R | b | r | | | 「 | イ | ツ | × | ≡ | θ |
| xxxx0011 | (4) | | | # | 3 | C | S | c | s | | | 」 | ウ | テ | モ | ε | ε |
| xxxx0100 | (5) | | | \$ | 4 | D | T | d | t | | | 、 | イ | 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 | | | フ | キ | ヌ | ラ | g | π |
| xxxx1000 | (1) | | | (| 8 | H | X | h | x | | | イ | ク | ネ | リ | √ | ∞ |
| xxxx1001 | (2) | | |) | 9 | I | Y | i | y | | | ウ | ケ | ル | ル | ˆ | γ |
| xxxx1010 | (3) | | | * | : | J | Z | j | z | | | エ | コ | ハ | レ | j | ≠ |
| xxxx1011 | (4) | | | + | ; | K | [| k | [| | | オ | サ | ヒ | ロ | × | ≠ |
| xxxx1100 | (5) | | | , | < | L | ¥ | l | l | | | カ | シ | フ | ワ | φ | ≠ |
| xxxx1101 | (6) | | | - | = | M |] | m |] | | | ユ | ス | ハ | ン | ≡ | ÷ |
| xxxx1110 | (7) | | | . | > | N | ^ | n | → | | | ヨ | セ | ホ | 〃 | ≡ | |
| xxxx1111 | (8) | | | / | ? | O | _ | o | + | | | ツ | ソ | マ | □ | ö | ■ |

Example Initialization Program

8-bit Initialization:

```

/*****/
void command(char i)
{
    P1 = i;                //put data on output Port
    D_I =0;                //D/I=LOW : send instruction
    R_W =0;                //R/W=LOW : Write
    E = 1;
    Delay(1);              //enable pulse width >= 300ns
    E = 0;                 //Clock enable: falling edge
}
/*****/
void write(char i)
{
    P1 = i;                //put data on output Port
    D_I =1;                //D/I=LOW : send data
    R_W =0;                //R/W=LOW : Write
    E = 1;
    Delay(1);              //enable pulse width >= 300ns
    E = 0;                 //Clock enable: falling edge
}
/*****/
void init()
{
    E = 0;
    Delay(100);            //Wait >15 msec after power is applied
    command(0x30);         //command 0x30 = Wake up
    Delay(30);             //must wait 5ms, busy flag not available
    command(0x30);         //command 0x30 = Wake up #2
    Delay(10);             //must wait 160us, busy flag not available
    command(0x30);         //command 0x30 = Wake up #3
    Delay(10);             //must wait 160us, busy flag not available
    command(0x38);         //Function set: 8-bit/2-line
    command(0x10);         //Set cursor
    command(0x0c);         //Display ON; Cursor ON
    command(0x06);         //Entry mode set
}
/*****/
```

4-bit Initialization:

```

/*****/
void command(char i)
{
    P1 = i;                //put data on output Port
    D_I = 0;              //D/I=LOW : send instruction
    R_W = 0;              //R/W=LOW : Write
    Nybble();             //Send lower 4 bits
    i = i<<4;             //Shift over by 4 bits
    P1 = i;                //put data on output Port
    Nybble();             //Send upper 4 bits
}
/*****/
void write(char i)
{
    P1 = i;                //put data on output Port
    D_I = 1;              //D/I=HIGH : send data
    R_W = 0;              //R/W=LOW : Write
    Nybble();             //Clock lower 4 bits
    i = i<<4;             //Shift over by 4 bits
    P1 = i;                //put data on output Port
    Nybble();             //Clock upper 4 bits
}
/*****/
void Nybble()
{
    E = 1;
    Delay(1);              //enable pulse width >= 300ns
    E = 0;                 //Clock enable: falling edge
}
/*****/
void init()
{
    P1 = 0;
    P3 = 0;
    Delay(100);           //Wait >15 msec after power is applied
    P1 = 0x30;            //put 0x30 on the output port
    Delay(30);            //must wait 5ms, busy flag not available
    Nybble();             //command 0x30 = Wake up
    Delay(10);            //must wait 160us, busy flag not available
    Nybble();             //command 0x30 = Wake up #2
    Delay(10);            //must wait 160us, busy flag not available
    Nybble();             //command 0x30 = Wake up #3
    Delay(10);            //can check busy flag now instead of delay
    P1= 0x20;             //put 0x20 on the output port
    Nybble();             //Function set: 4-bit interface
    command(0x28);        //Function set: 4-bit/2-line
    command(0x10);        //Set cursor
    command(0x0F);        //Display ON; Blinking cursor
    command(0x06);        //Entry Mode set
}
/*****/
```

Quality Information

| Test Item | Content of Test | Test Condition | Note |
|---------------------------------------|---|---|------|
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | +80°C , 48hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C , 48hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time. | +70°C 48hrs | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C , 48hrs | 1,2 |
| High Temperature / Humidity Operation | Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time. | +40°C , 90% RH , 48hrs | 1,2 |
| Thermal Shock resistance | Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress. | 0°C,30min -> 25°C,5min -> 50°C,30min = 1 cycle 10 cycles | |
| Vibration test | Endurance test applying vibration to simulate transportation and use. | 10-55Hz , 15mm amplitude. 60 sec in each of 3 directions X,Y,Z For 15 minutes | 3 |
| Static electricity test | Endurance test applying electric static discharge. | VS=800V, RS=1.5kΩ, CS=100pF One time | |

Note 1: No condensation to be observed.

Note 2: Conducted after 4 hours of storage at 25°C, 0%RH.

Note 3: Test performed on product itself, not inside a container.

Precautions for using LCDs/LCMs

See Precautions at www.newhavendisplay.com/specs/precautions.pdf

Warranty Information and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms