

NHD-24064CZ-FSW-GBW

Graphic Liquid Crystal Display Module

| | |
|--------|--------------------------|
| NHD- | Newhaven Display |
| 24064- | 240 x 64 Pixels |
| CZ- | Model |
| F- | Transflective |
| SW- | Side White LED Backlight |
| G- | STN Gray, Positive |
| B- | 6:00 Optimal View |
| W- | Wide Temperature |
| | RoHS Compliant |

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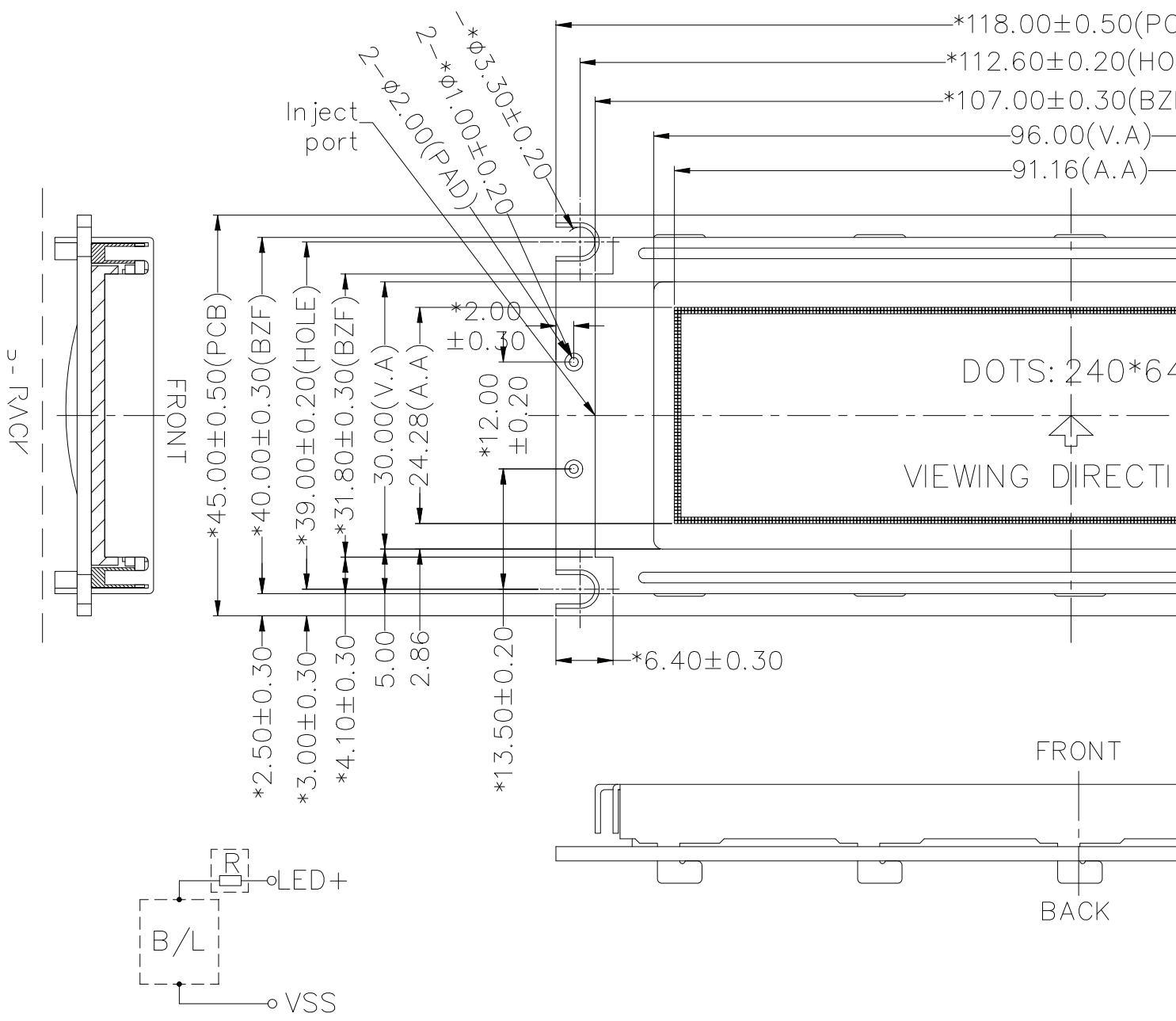
Document Revision History

| Revision | Date | Description | Changed by |
|----------|---------|--|------------|
| 0 | 2/29/08 | Initial Release | - |
| 1 | 7/20/09 | User guide reformat | BE |
| 2 | 12/4/09 | Pin Description Revised | BE |
| 3 | 4/15/10 | Updates | BE |
| 4 | 5/5/10 | Electrical updated | BE |
| 5 | 4/12/13 | Drawing page and Electrical & Optical Characteristics updated. | JN |
| 6 | 5/3/13 | Added font table | JN |
| 7 | 7/17/13 | Mechanical drawing updated. | JN |
| 8 | 9/7/15 | Module redesigned | AK |
| 9 | 5/9/18 | Backlight Characteristics Updated | SB |

Functions and Features

- 240 x 64 pixels
- Built-in RA6963 controller
- +5.0V Power Supply
- 1/64 duty, 1/9 bias
- RoHS Compliant

A
B
C
D
E
F



CONSTANT VOLTAGE: 5.0V, 60mA (MAX)
 BACKLIGHT DRIVER CIRCUIT DIAGRAM

- Notes:**
1. Driver: 1/64 Duty, 1/9 Bias
 2. Display Mode: STN Positive / Gray / Transflective
 3. Optimal View: 6:00
 4. Voltage: 5.0V VDD, 13.5V VLCD
 5. Backlight: White LED
 6. Driver IC: RA6963

Label
 NEWHAVEN DISPLAY
 NHD-24064CZ-FSW
 -GBW_Rev1A
 WYYY

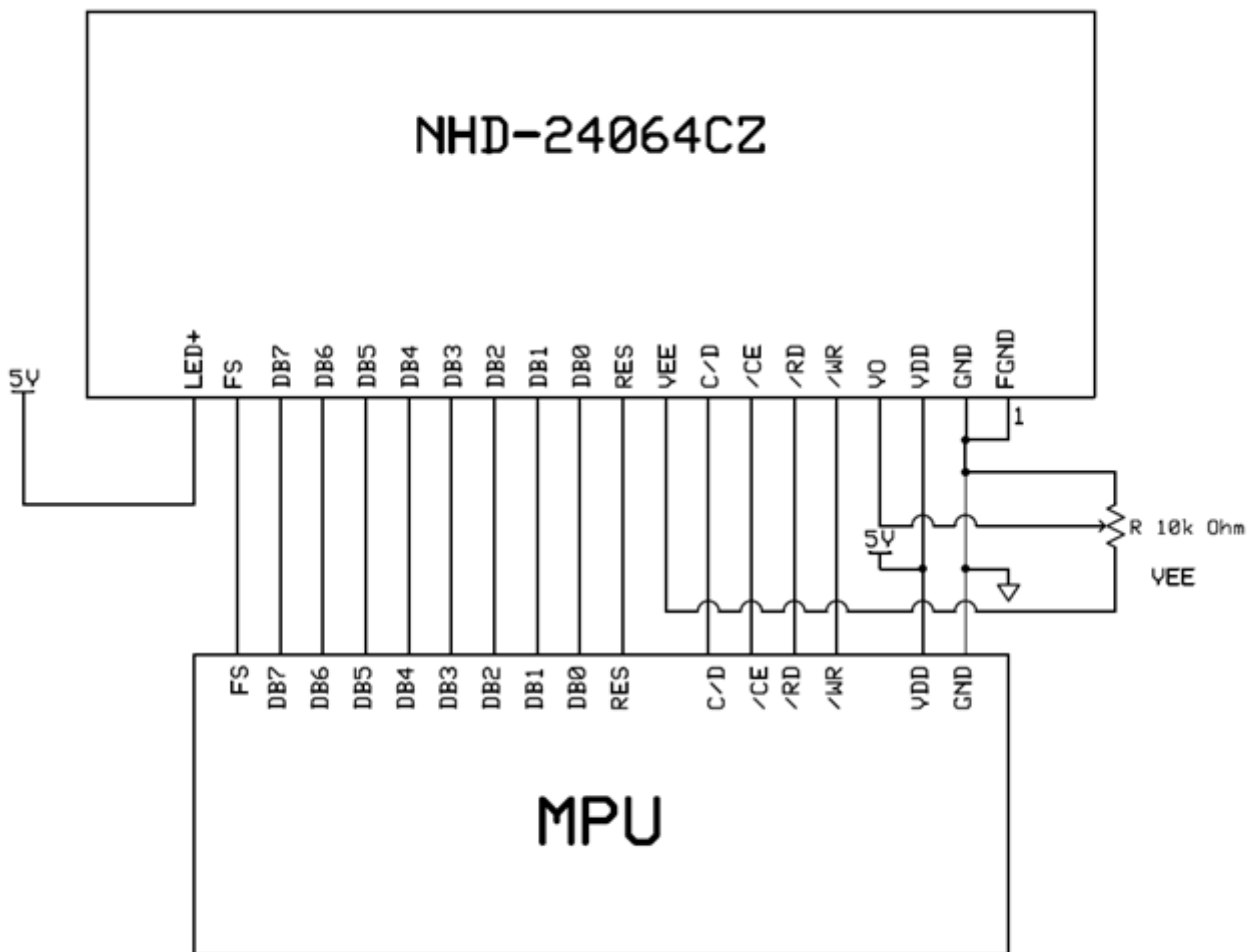
1 2 3 4

Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---------|---------|---------------------|--|
| 1 | FGND | Power Supply | Frame Ground |
| 2 | VSS | Power Supply | Ground for LCD and Backlight |
| 3 | VDD | Power Supply | Power supply for logic (+5.0V) |
| 4 | V0 | Adj. Power Supply | Power Supply for contrast (approx. -8.5V) |
| 5 | /WR | MPU | Active LOW Write signal |
| 6 | /RD | MPU | Active LOW Read signal |
| 7 | /CE | MPU | Active LOW Chip Enable |
| 8 | C/D | MPU | Register select signal C/D=0: DATA, C/D=1: COMMAND |
| 9 | VEE | Power Supply | Negative voltage output (-10V) |
| 10 | RES | MPU | Active LOW reset signal |
| 11~18 | DB0~DB7 | MPU | Bi-directional 8-bit data bus |
| 19 | FS | MPU | Font Select: 1=6x8 fonts, 0=8x8 fonts |
| 20 | LED+ | Power Supply | Power supply for LED Backlight (+5.0V via on-board resistor) |

Recommended LCD connector: 2.54mm pitch pins

Backlight connector: Anode at Pin 20 of LCD connector **Mates with:** -



Electrical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|------------------|--------------------------|-----------------------|------|------------------------|------|
| Operating Temperature Range | T _{OP} | Absolute Max | -20 | - | +70 | °C |
| Storage Temperature Range | T _{ST} | Absolute Max | -30 | - | +80 | °C |
| Supply Voltage | V _{DD} | - | 4.75 | 5.0 | 5.25 | V |
| Supply Current | I _{DD} | V _{DD} = 5.0V | 6 | 12 | 25 | mA |
| Supply for LCD (contrast) | V _{LCD} | T _{OP} = 25°C | 13.2 | 13.5 | 13.8 | V |
| "H" Level input | V _{IH} | - | 0.8 * V _{DD} | - | V _{DD} | V |
| "L" Level input | V _{IL} | - | 0 | - | 0.15 * V _{DD} | V |
| "H" Level output | V _{OH} | - | V _{DD} - 0.3 | - | V _{DD} | V |
| "L" Level output | V _{OL} | - | V _{SS} | - | 0.3 | V |
| Backlight Supply Voltage | V _{LED} | - | 4.8 | 5.0 | 5.2 | V |
| Backlight Supply Current | I _{LED} | V _{LED} = 5.0 V | 15 | 32 | 60 | mA |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------|--------|------------------------|------|------|------|------|
| Optimal Viewing Angles | Top | CR ≥ 2 | - | 40 | - | ° |
| | Bottom | | - | 40 | - | ° |
| | Left | | - | 35 | - | ° |
| | Right | | - | 35 | - | ° |
| Contrast Ratio | CR | - | 2 | 5 | - | - |
| Response Time | Rise | T _{OP} = 25°C | - | 150 | 250 | ms |
| | Fall | | - | 110 | 210 | ms |

Controller Information

Built-in RA6963 controller.

Please download specification at http://www.newhavendisplay.com/app_notes/RA6963.pdf

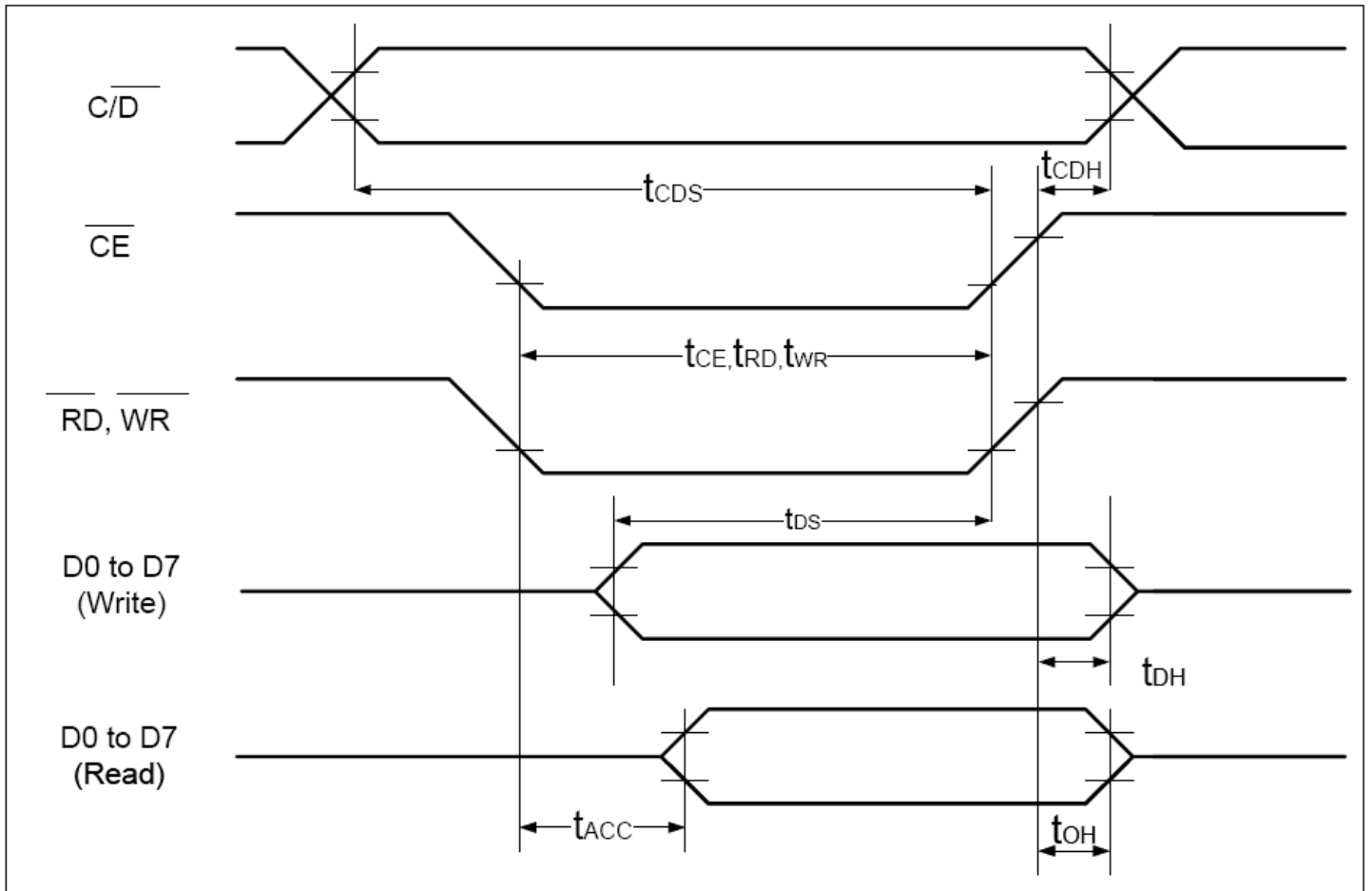
Table of Commands

| Command | Code | D1 | D2 | Function |
|------------------------------|----------|-------------|--------------|---------------------------------|
| Registers Setting | 00100001 | X address | Y address | Set cursor pointer |
| | 00100010 | Data | 00h | Set Offset Register |
| | 00100100 | Low address | High address | Set Address pointer |
| Set Control Word | 01000000 | Low address | High address | Set Text Home Address |
| | 01000001 | Columns | 00h | Set Text Area |
| | 01000010 | Low address | High address | Set Graphic Home Address |
| | 01000011 | Columns | 00h | Set Graphic Area |
| Mode Set | 1000X000 | -- | -- | OR mode |
| | 1000X001 | -- | -- | EXOR mode |
| | 1000X011 | -- | -- | AND mode |
| | 1000X100 | -- | -- | Text Attribute mode |
| | 10000XXX | -- | -- | Internal CG ROM mode |
| | 10001XXX | -- | -- | External CG RAM mode |
| Display Mode | 10010000 | -- | -- | Display off |
| | 1001XX10 | -- | -- | Cursor on, blink off |
| | 1001XX11 | -- | -- | Cursor on, blink on |
| | 100101XX | -- | -- | Text on, graphic off |
| | 100110XX | -- | -- | Text off, graphic on |
| | 100111XX | -- | -- | Text on, graphic on |
| Cursor Pattern Select | 10100000 | -- | -- | 1-line cursor |
| | 10100001 | -- | -- | 2-line cursor |
| | 10100010 | -- | -- | 3-line cursor |
| | 10100011 | -- | -- | 4-line cursor |
| | 10100100 | -- | -- | 5-line cursor |
| | 10100101 | -- | -- | 6-line cursor |
| | 10100110 | -- | -- | 7-line cursor |
| | 10100111 | -- | -- | 8-line cursor |
| Data Read/Write | 11000000 | Data | -- | Data Write and Increment ADP |
| | 11000001 | -- | -- | Data Read and Increment ADP |
| | 11000010 | Data | -- | Data Write and Decrement ADP |
| | 11000011 | -- | -- | Data Read and Decrement ADP |
| | 11000100 | Data | -- | Data Write and Non-variable ADP |
| | 11000101 | -- | -- | Data Read and Non-variable ADP |
| Data auto Read/Write | 10110000 | -- | -- | Set Data Auto Write |
| | 10110001 | -- | -- | Set Data Auto Read |
| | 10110010 | -- | -- | Auto Reset |
| Screen Peek | 11100000 | -- | -- | Screen Peek |
| Screen Copy | 11101000 | | | Screen Copy |
| Bit Set/Reset | 11110XXX | -- | -- | Bit Reset |
| | 11111XXX | -- | -- | Bit Set |
| | 1111X000 | -- | -- | Bit 0 (LSB) |
| | 1111X001 | -- | -- | Bit 1 |
| | 1111X010 | -- | -- | Bit 2 |
| | 1111X011 | -- | -- | Bit 3 |
| | 1111X100 | -- | -- | Bit 4 |
| | 1111X101 | -- | -- | Bit 5 |
| | 1111X110 | -- | -- | Bit 6 |
| 1111X111 | -- | -- | Bit 7 (MSB) | |
| Screen Reverse | 11010000 | Data | -- | Whole screen reverse |

Timing Characteristics

($V_{DD}=+5V\pm 5\%$, $GND=0V$, $T_a = -20$ to $+70^\circ C$)

| Item | Symbol | Test Conditions | Min. | Max. | Unit |
|---|--------------------------------|-----------------|------|------|------|
| C/ \overline{D} Set Up Time | t_{CDS} | -- | 100 | -- | ns |
| C/ \overline{D} Hold Time | t_{CDH} | -- | 10 | -- | ns |
| \overline{CE} , \overline{RD} , \overline{WR} Pulse Width | t_{CE} , t_{RD} , t_{WR} | -- | 80 | -- | ns |
| Data Set Up Time | t_{DS} | -- | 80 | -- | ns |
| Data Hold Time | t_{DH} | -- | 40 | -- | ns |
| Access Time | t_{ACC} | -- | -- | 150 | ns |
| Output Hold Time | t_{OH} | -- | 10 | 50 | ns |



Built-in Font Table

| LSB \ MSB | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|-----------|---|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | ! | " | # | \$ | % | & | ' | (|) | * | + | , | - | . | / |
| 1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| 2 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | |
| 3 | P | Q | R | S | T | U | V | W | X | Y | Z | [| \ |] | ^ | _ |
| 4 | ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| 5 | p | q | r | s | t | u | v | w | x | y | z | { | | } | ~ | |
| 6 | ö | ü | ë | ä | å | ä | ä | ö | ë | ë | ë | ï | ï | ï | ä | ä |
| 7 | é | æ | ê | ô | ô | ô | ô | ü | ö | ö | ö | £ | ¥ | ¤ | ¢ | ¢ |

Example Initialization Program

```
void command(int A)
{
    P1 = A;
    ID = 1;           //Command
    CE = 0;
    WRT = 0;
    WRT = 1;
    CE = 1;
}

void data(int A)
{
    P1 = A;
    ID = 0;           //Data
    CE = 0;
    WRT = 0;
    WRT = 1;
    CE = 1;
}

void init()
{
    RST = 1;
    RDD = 1;
    F_S = 1;
    data(0x00);
    data(0x00);
    commnd(0x40);     //Set Text Home Address
    data(0x00);       //Low Address Columns
    data(0x40);       //High Address
    command(0x42);     //Set Graphic Home Address
    data(0x1E);       //Low Address Columns
    data(0x00);       //High Address
    command(0x41);     //Set Text Area
    data(0x1E);       //Low Address Columns
    data(0x00);       //High Address
    command(0x43);     //Set Graphic Areaa
    command(0x80);     //Mode Set to 'OR' mode
}
```

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, 200 Hrs. | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C, 200 Hrs. | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time. | +70°C, 200 Hrs. | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C, 200 Hrs. | 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. | +60°C, 90% RH, 96 Hrs. | 1,2 |
| Thermal Shock resistance | Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress. | -20°C,30min -> 25°C,5min -> 70°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

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