

NHD-12864WG-FTGH-VZ#

Graphic Liquid Crystal Display Module

| | |
|--------|---|
| NHD- | Newhaven Display |
| 12864- | 128 x 64 pixels |
| WG- | Display Type: Graphic |
| F- | Model |
| T- | White LED Backlight |
| G- | STN- Gray |
| H- | Transflective, Wide Temperature (-20°C ~ +70°C) 6:00 view |
| VZ#- | Built-in DC-DC voltage converter |
| | RoHS Compliant |

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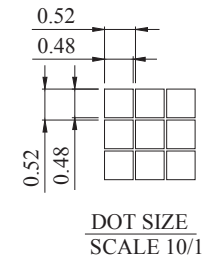
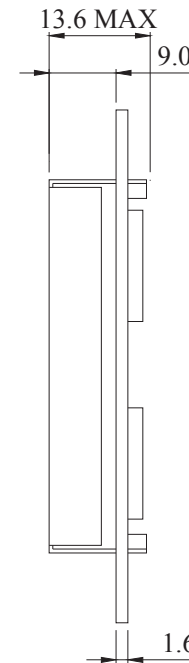
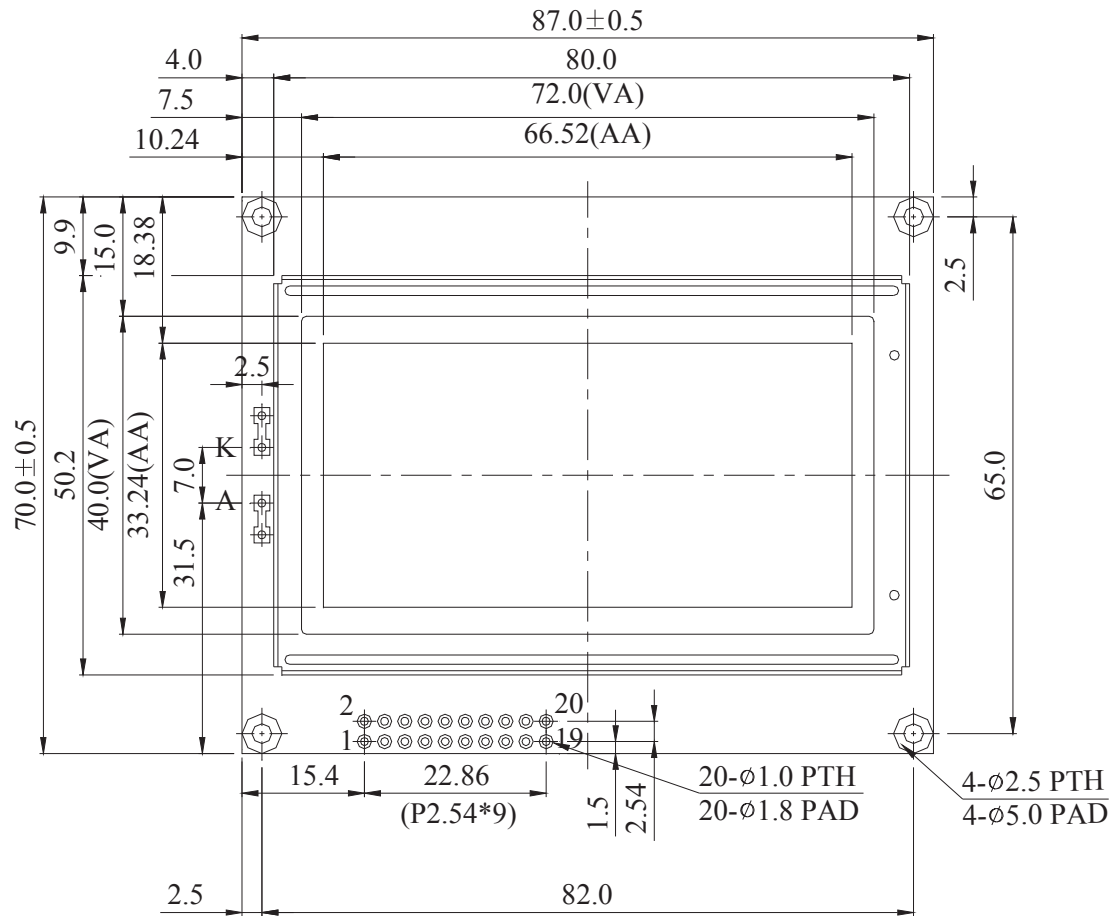
Document Revision History

| Revision | Date | Description | Changed by |
|----------|------------|--------------------------------------|------------|
| 0 | 10/30/2008 | Initial Release | - |
| 1 | 3/23/2010 | User guide reformat | BE |
| 2 | 5/6/2010 | Block diagram/initialization updated | BE |
| | | | |

Functions and Features

- 128 x 64 pixels
- Built-in RA6963 Controller
- +5.0V power supply
- 1/64 duty cycle
- RoHS Compliant

Mechanical Drawing



LED B/L

| PIN NO. | SYMBOL |
|---------|--------|
| 1 | Vss |
| 2 | Vdd |
| 3 | Vo |
| 4 | C/D |
| 5 | /RD |
| 6 | /WR |
| 7 | DB0 |
| 8 | DB1 |
| 9 | DB2 |
| 10 | DB3 |
| 11 | DB4 |
| 12 | DB5 |
| 13 | DB6 |
| 14 | DB7 |
| 15 | /CE |
| 16 | /RST |
| 17 | Vee |
| 18 | MD2 |
| 19 | FS1 |
| 20 | HLT |

Newhaven Display

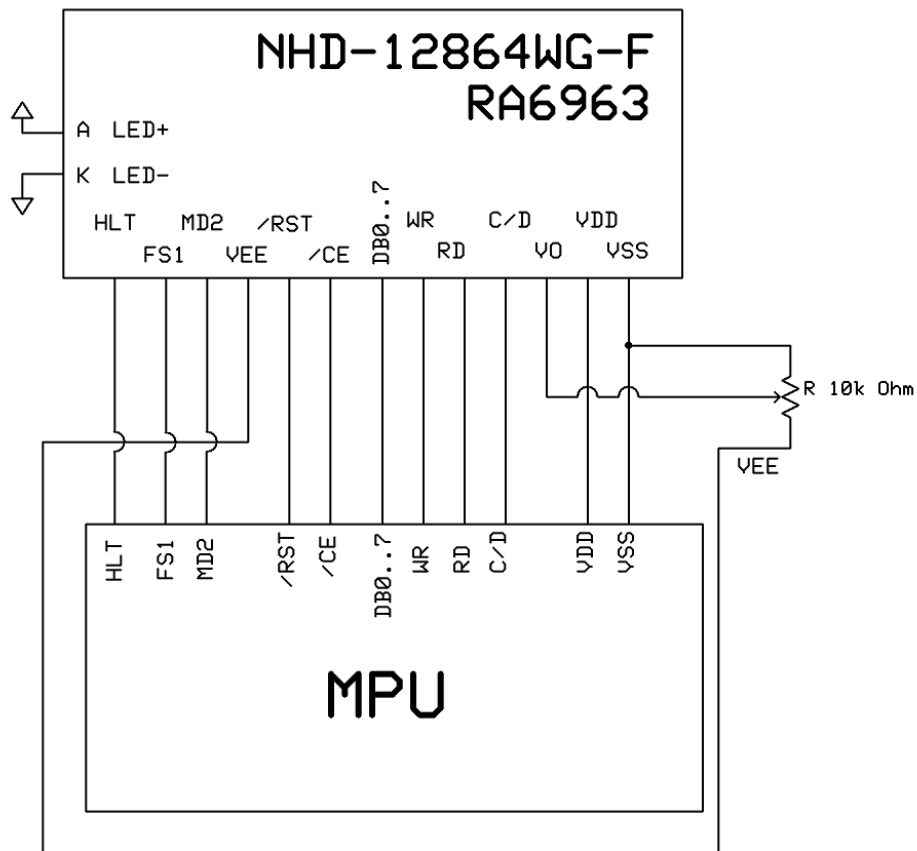
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Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---------|---------|---------------------|--|
| 1 | VSS | Power Supply | Ground |
| 2 | VDD | Power Supply | Power supply for logic (+5.0V) |
| 3 | V0 | Adj.Power Supply | Power Supply for contrast (approx. -3.0V) |
| 4 | C/D | MPU | Register select signal. C/D=0: DATA C/D=1: COMMAND |
| 5 | /RD | MPU | Active LOW Read signal |
| 6 | /WR | MPU | Active LOW Write signal |
| 7-14 | DB0-DB7 | MPU | Bi-directional 8-bit data bus |
| 15 | /CE | MPU | Active LOW Chip enable |
| 16 | /RST | MPU | Active LOW Reset Signal |
| 17 | Vee | Power Supply | Negative voltage output (-5.0V) |
| 18 | MD2 | MPU | Column select; H:32 column; L: 40 column |
| 19 | FS1 | MPU | Font Select: 1 : 6x8 fonts, 0 : 8x8 fonts |
| 20 | HLT | MPU | Clock operating stop signal |
| A | LED+ | Power Supply | Power Supply for LED Backlight (+3.5V) |
| K | LED- | Power Supply | Ground for Backlight |

Recommended LCD connector: 2.54mm pitch pins

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 | | 4.75 | 5.0 | 5.25 | V |
| Supply Current | IDD | Ta=25°, VDD=5.0V | 12.0 | 16.0 | 20.0 | mA |
| Supply for LCD (contrast) | VDD-V0 | Ta=25° | - | 8.0 | - | V |
| "H" Level input | VIH | | VDD-2.2 | - | VDD | V |
| "L" Level input | VIL | - | 0 | - | 0.8 | V |
| "H" Level output | VOH | - | VDD-0.3 | - | VDD | V |
| "L" Level output | VOL | - | 0 | - | 0.3 | V |
| | | | | | | |
| Backlight Supply Voltage | VLED | - | 3.4 | 3.5 | 3.6 | V |
| Backlight Supply Current | ILED | VLED=3.5V | 65 | 80 | 100 | mA |
| Backlight Lifetime | - | ILED=80mA | - | 50,000 | - | Hrs. |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------------------|--------|-----------|------|------|------|------|
| Viewing Angle - Vertical (top) | AV | Cr ≥ 2 | - | 20 | - | ° |
| Viewing Angle - Vertical (bottom) | AV | Cr ≥ 2 | - | 40 | - | ° |
| Viewing Angle - Horizontal (left) | AH | Cr ≥ 2 | - | 30 | - | ° |
| Viewing Angle - Horizontal (right) | AH | Cr ≥ 2 | - | 30 | - | ° |
| Contrast Ratio | Cr | | - | 3 | - | - |
| Response Time (rise) | Tr | - | - | 150 | 200 | ms |
| Response Time (fall) | Tf | - | - | 150 | 200 | ms |

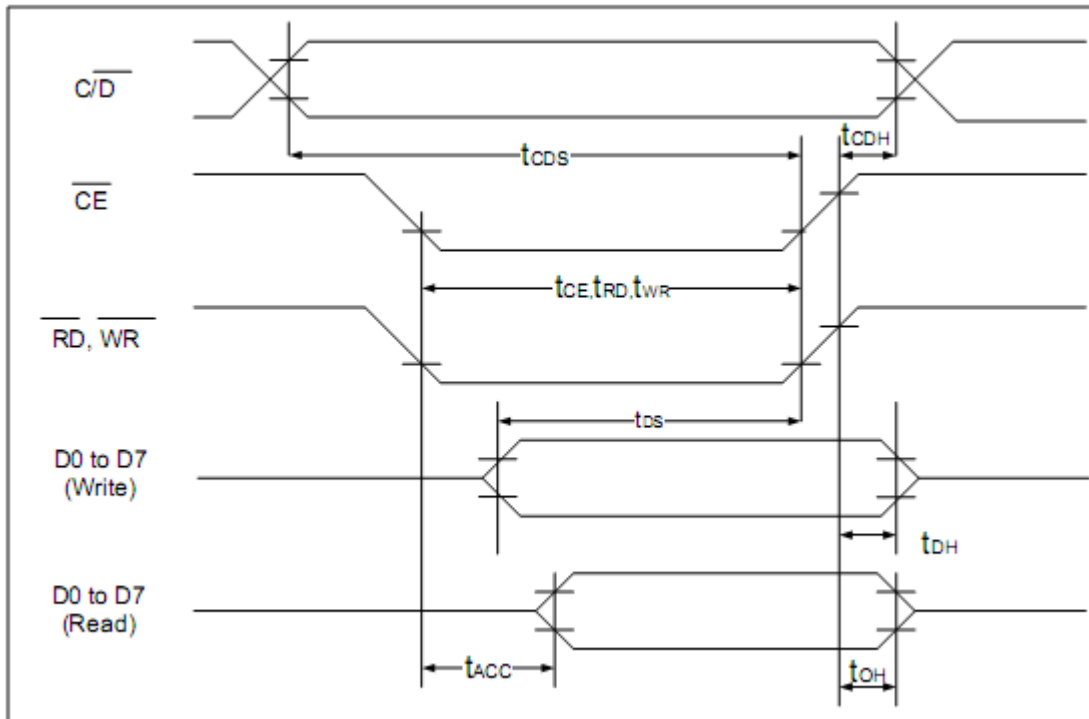
Controller Information

Built-in RA6963. 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 |

Example Initialization Program

```
//=====
#define LCM_PORT P1 //DB0~DB7,DATA BUS
sbit CD = P3^0; // DATA / INSTRUCTION
sbit FS = P3^1; // CHIP ENABLE
sbit MD2 = P3^2; // CHIP RESET
sbit RESET = P3^3; // CHOICE CHIP1
sbit CE = P3^4; // CHIP READ/WRITE
sbit WR = P3^6; // CHOICE CHIP2
sbit RD = P3^7;
//-----
// initial T6963C
//-----
void Initial_T6963C()
{
    /*write text home address=0000h */
    Write_data(0x00);
    Write_data(0x00);
    Write_command(0x40);

    Write_data(0x80);
    Write_data(0x00);
    Write_command(0x42);

    /*write text area address*/
    Write_data(0x10);
    Write_data(0x00);
    Write_command(0x41);

    /*write graphic area address*/
    Write_data(0x10);
    Write_data(0x00);
    Write_command(0x43);

    /*set display mode Display mode set (Graphic only enable)*/
    Write_command(0x80);
    /*Graphic display enable*/
    Write_command(0x98);
}
//-----
// Write Data Function
//-----
void Write_data(data){
    P1=data;
    CD=0;

    CE=0;
    WR=0;

    CE=1;
    WR=1;
}
//-----
// Write Command Function
//-----
void Write_command(command){
    P1 = command;
    CD=1;

    CE=0;
    WR=0;
    CE=1;
    WR=1;
}
//=====
```


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 , 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C , 200hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time. | +70°C 200hrs | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C , 200hrs | 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 , 96hrs | 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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- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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