

NHD-C160100CZ-RN-FBW

COG (Chip-On-Glass) Liquid Crystal Display Module

| | |
|----------|---------------------------|
| NHD- | Newhaven Display |
| C160100- | 160 x 100 pixels |
| CZ- | Model |
| R- | Reflective |
| N- | No backlight |
| F- | FSTN (+) |
| B- | 6:00 view |
| W- | Wide Temp (-20°C ~ +70°C) |
| | RoHS Compliant |

Newhaven Display International, Inc.

2511 Technology Drive, Suite 101

Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

www.newhavendisply.com

nhtech@newhavendisply.com

nhsales@newhavendisply.com

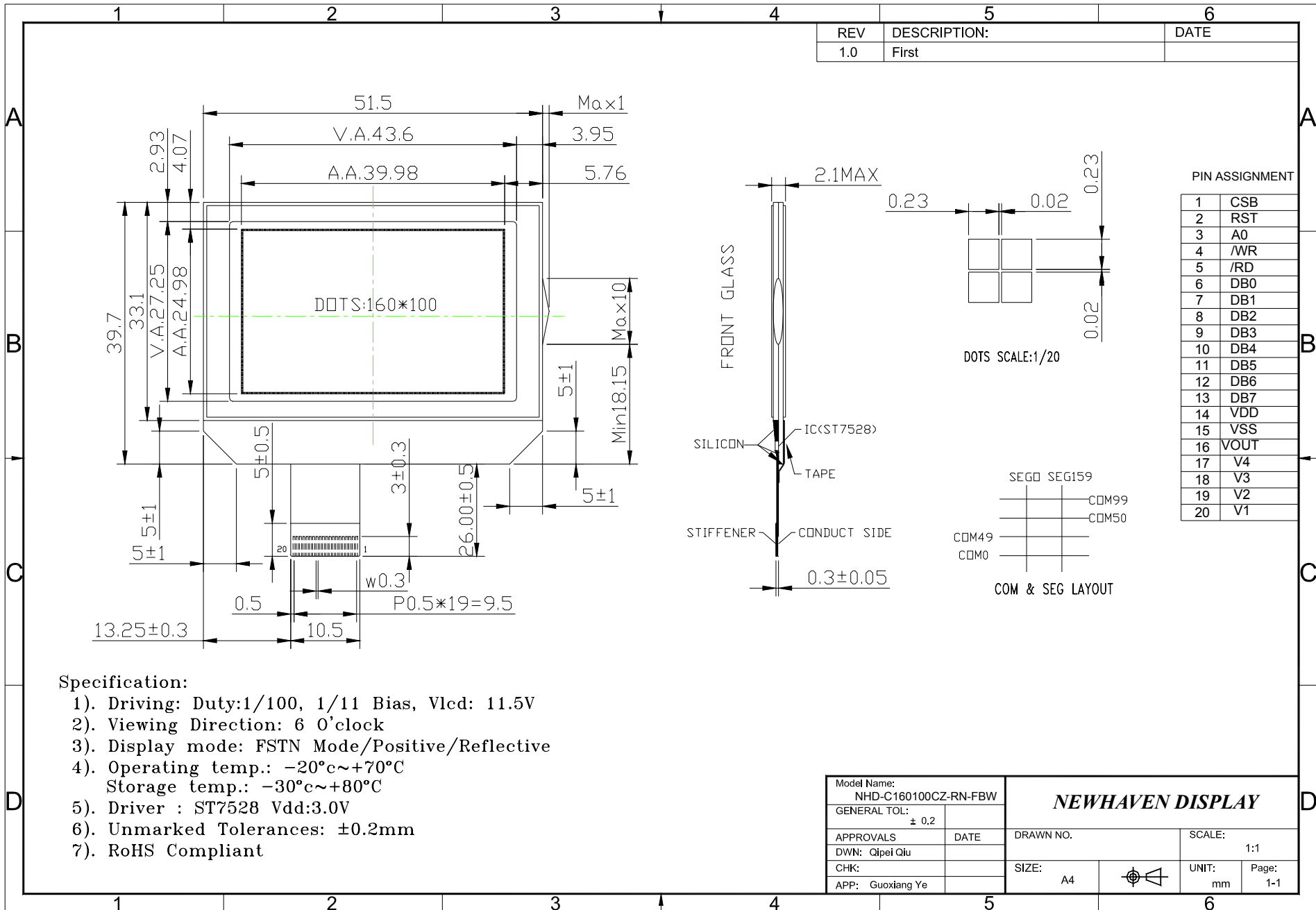
Document Revision History

| Revision | Date | Description | Changed by |
|----------|------------|---|------------|
| 0 | 6/17/2007 | Initial Release | - |
| 1 | 9/11/2009 | User guide reformat | BE |
| 2 | 10/14/2009 | Updated Electrical Characteristic | MC |
| 3 | 12/08/2009 | Updated Block Diagram, Pins 4 and 5, and Timing Characteristics | MC |

Functions and Features

- 160 x 100 pixels
- Built-in ST7528 controller
- +3.0V power supply
- 1/100 duty cycle; 1/11 bias
- RoHS Compliant

Mechanical Drawing



Specification:

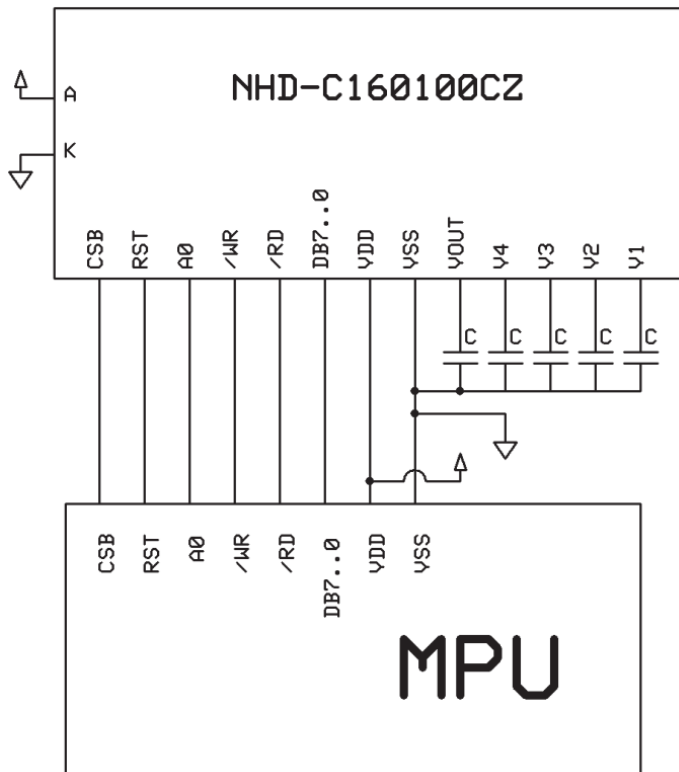
- 1). Driving: Duty:1/100, 1/11 Bias, Vlcd: 11.5V
- 2). Viewing Direction: 6 O'clock
- 3). Display mode: FSTN Mode/Positive/Reflective
- 4). Operating temp.: -20°C~+70°C
Storage temp.: -30°C~+80°C
- 5). Driver : ST7528 Vdd:3.0V
- 6). Unmarked Tolerances: ±0.2mm
- 7). RoHS Compliant

Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---------|---------|---------------------|---|
| 1 | CSB | MPU | Active Low chip select |
| 2 | RST | MPU | Active Low Reset signal |
| 3 | A0 | MPU | Register select signal. A0=1: Data, A0=0: Command |
| 4 | /WR | MPU | Active LOW write signal |
| 5 | /RD | MPU | Active LOW read signal |
| 6-13 | DB0-DB7 | MPU | Bi-directional 8-bit data bus. |
| 14 | VDD | Power Supply | Power supply for LCD and logic (+3.0V) |
| 15 | Vss | Power Supply | Ground |
| 16 | VOUT | Power Supply | Connect to 1uF cap to VSS or VDD |
| 17 | V4 | Power Supply | 1.0uF-2.2uF cap to Vss |
| 18 | V3 | Power Supply | 1.0uF-2.2uF cap to Vss |
| 19 | V2 | Power Supply | 1.0uF-2.2uF cap to Vss |
| 20 | V1 | Power Supply | 1.0uF-2.2uF cap to Vss |

Recommended LCD connector: 0.5mm pitch pins. Molex p/n: 52746-2070

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 | | 2.8 | 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 | - | 11.5 | - | 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 |
| | | | | | | |

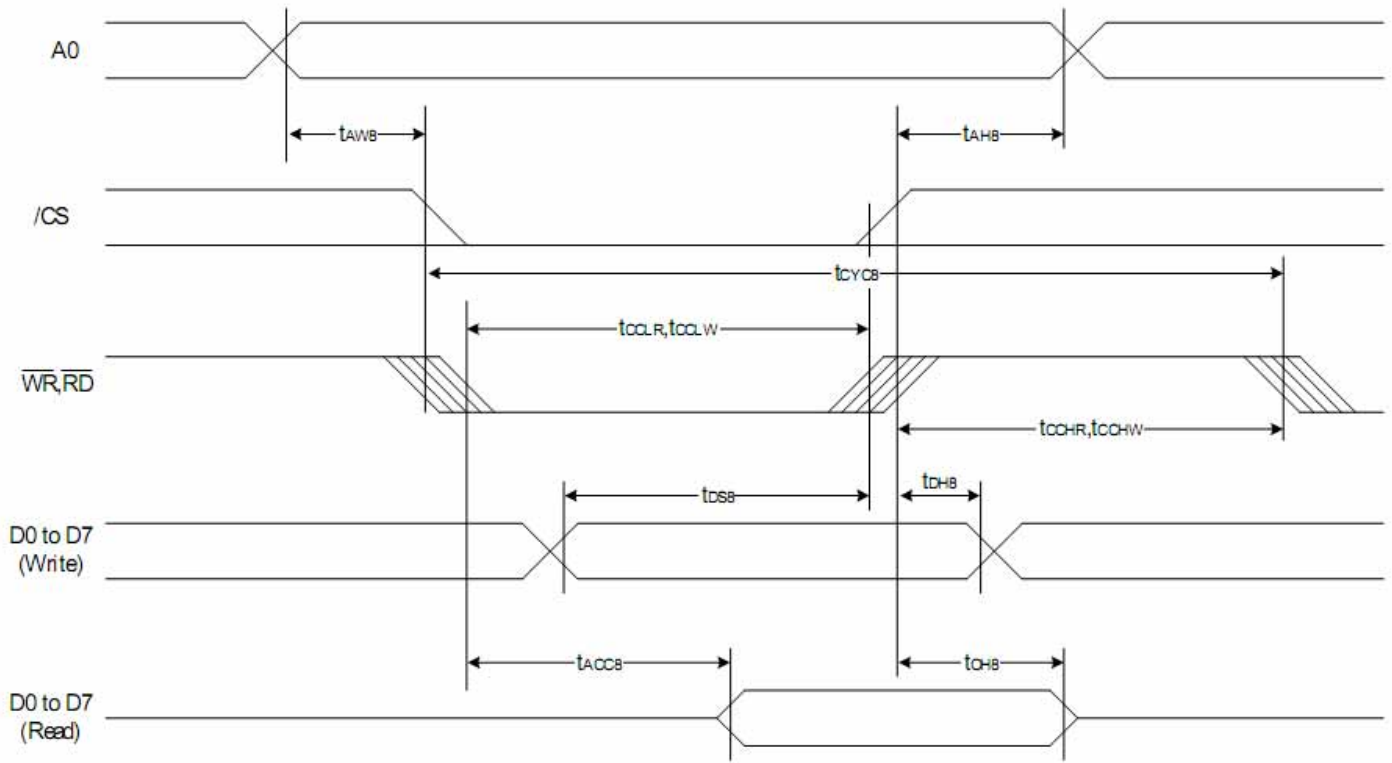
Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------------|--------|-----------|------|------|------|------|
| Viewing Angle - Vertical | | Cr≥2 | -60 | - | +35 | ° |
| Viewing Angle - Horizontal | Φ | | -40 | - | +40 | ° |
| Contrast Ratio | CR | | - | 6 | - | - |
| Response Time (rise) | Tr | - | - | 150 | 250 | ms |
| Response Time (fall) | Tf | - | - | 150 | 250 | ms |

Controller Information

Built-in ST7528. Download specification at http://www.newhavendisplay.com/app_notes/ST7528.pdf

Timing Characteristics



(VDD = 3.3V , Ta =25°C)

| Item | Signal | Symbol | Condition | Rating | | Units |
|------------------------------|----------|--------|-------------|--------|------|-------|
| | | | | Min. | Max. | |
| Address hold time | A0 | tAH8 | | 0 | — | ns |
| Address setup time | | tAW8 | | 0 | — | |
| System cycle time | | tCYC8 | | 240 | — | |
| Enable L pulse width (WRITE) | WR | tCCLW | | 80 | — | |
| Enable H pulse width (WRITE) | | tCCHW | | 80 | — | |
| Enable L pulse width (READ) | RD | tCCLR | | 140 | — | |
| Enable H pulse width (READ) | | tCCHR | | 80 | — | |
| WRITE Data setup time | D0 to D7 | tDS8 | | 40 | — | |
| WRITE Data hold time | | tDH8 | | 10 | — | |
| READ access time | | tACC8 | CL = 100 pF | — | 70 | |
| READ Output disable time | | tOH8 | CL = 100 pF | 5 | 50 | |

Table of Commands

| Instruction | A0 | RW | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Description |
|-----------------------------------|----|----|------------|-----|-----|-----|-----|-----|-----|-----------------------|---|
| EXT=0 or 1 | | | | | | | | | | | |
| Mode Set | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 2-byte instruction to set Mode and FR(Frame frequency control) BE(Booster efficiency control) |
| | 0 | 0 | FR3 | FR2 | FR1 | FR0 | 0 | BE | x' | EXT | |
| EXT=0 | | | | | | | | | | | |
| Read display data | 1 | 1 | Read data | | | | | | | Read data into DDRAM | |
| Write display data | 1 | 0 | Write data | | | | | | | Write data into DDRAM | |
| Read status | 0 | 1 | BUSY | ON | RES | MF2 | MF1 | MF0 | DS1 | DS0 | Read the internal status |
| ICON control register ON/OFF | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | ICON | ICON=0: ICON disable(default) ICON=1: ICON enable & set the page address to 16 |
| Set page address | 0 | 0 | 1 | 0 | 1 | 1 | P3 | P2 | P1 | P0 | Set page address |
| Set column address MSB | 0 | 0 | 0 | 0 | 0 | 1 | Y9 | Y8 | Y7 | Y6 | Set column address MSB |
| Set column address LSB | 0 | 0 | 0 | 0 | 0 | 0 | Y5 | Y4 | Y3 | Y2 | Set column address LSB |
| Set modify-read | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Set modify-read mode |
| Reset modify-read | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | release modify-read mode |
| Display ON/OFF | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | D | D=0: Display OFF D=1: Display ON |
| Set initial display line register | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | x' | x' | 2-byte instruction to specify the initial display line to realize vertical scrolling |
| | 0 | 0 | x' | S6 | S5 | S4 | S3 | S2 | S1 | S0 | |
| Set initial COM0 register | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | x' | x' | 2-byte instruction to specify the initial COM0 to realize window scrolling |
| | 0 | 0 | x' | C6 | C5 | C4 | C3 | C2 | C1 | C0 | |
| Set partial display duty ration | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | x' | x' | 2-byte instruction to set partial display duty ratio |
| | 0 | 0 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| Set N-line inversion | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | x' | x' | 2-byte instruction to set N-line inversion register |
| | 0 | 0 | x' | x' | x' | N4 | N3 | N2 | N1 | N0 | |
| Release N-line inversion | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | Release N-line inversion mode |
| Reverse display ON/OFF | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | REV | REV=0: normal display REV=1: reverse display |
| Entire display ON/OFF | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | EON | EON=0: normal display EON=1: entire display ON |

Example Initialization Program

```
//-----  
void write_command(unsigned char datum)  
{  
    A0=0; /*Instruction register*/  
    E=1; /*Read inactive*/  
    P1 = datum; /*put data on port 1*/  
    CS1=0; /*Chip select active*/  
    RW=0; /*Write active*/  
    RW=1; /*Write inactive; latch in data*/  
    CS1=1; /*Chip select inactive*/  
}  
  
//-----  
void write_data(unsigned char datum)  
{  
    A0=1; /*DDRAM data register*/  
    E=1;  
    P1=datum;  
    CS1=0;  
    RW=0;  
    RW=1;  
    CS1=1;  
}  
  
//-----  
void lcd_init(void){  
    write_command(0xA2); //ICON OFF;  
    write_command(0xAE); //Display OFF  
  
    write_command(0x48); //Set Duty ratio  
    write_command(0x80); //No operation  
    write_command(0xa1); //Set scan direction //changed from 0 to 1  
    write_command(0xc8); //SHL select  
    write_command(0x40); //Set START LINE  
    write_command(0x00);  
    write_command(0xab); //OSC on  
  
    write_command(0x64); //3x  
    delay(2000);  
    write_command(0x65); //4x  
    delay(2000);  
    write_command(0x66); //5x  
    delay(2000);  
    write_command(0x67); //6x  
    delay(2000);  
  
    write_command(Ra_Rb); //RESISTER SET  
    write_command(0x81); //Set electronic volume register  
    write_command(vopcode); //n=0~3f  
  
    write_command(0x57); //1/12bias  
    write_command(0x92); //FRC and pwm  
  
    write_command(0x2C);  
    delay(20000);//200ms
```



```
write_command(0x2E);
delay(20000);//200ms
write_command(0x2F);
delay(20000);//200ms
```

```
write_command(0x92); //frc and pwm
write_command(0x38); //external mode
write_command(0x75);
//start settings for 16-level grayscale
write_command(0x97); //3frc,45pwm
```

```
write_command(0x80);
write_command(0x00);
write_command(0x81);
write_command(0x00);
write_command(0x82);
write_command(0x00);
write_command(0x83);
write_command(0x00);
```

```
write_command(0x84);
write_command(0x06);
write_command(0x85);
write_command(0x06);
write_command(0x86);
write_command(0x06);
write_command(0x87);
write_command(0x06);
```

```
write_command(0x88);
write_command(0x0b);
write_command(0x89);
write_command(0x0b);
write_command(0x8a);
write_command(0x0b);
write_command(0x8b);
write_command(0x0b);
```

```
write_command(0x8c);
write_command(0x10);
write_command(0x8d);
write_command(0x10);
write_command(0x8e);
write_command(0x10);
write_command(0x8f);
write_command(0x10);
```

```
write_command(0x90);
write_command(0x15);
write_command(0x91);
write_command(0x15);
write_command(0x92);
write_command(0x15);
write_command(0x93);
write_command(0x15);
```

```
write_command(0x94);
write_command(0x1a);
write_command(0x95);
write_command(0x1a);
write_command(0x96);
write_command(0x1a);
```

```
write_command(0x97);  
write_command(0x1a);
```

```
write_command(0x98);  
write_command(0x1e);  
write_command(0x99);  
write_command(0x1e);  
write_command(0x9a);  
write_command(0x1e);  
write_command(0x9b);  
write_command(0x1e);
```

```
write_command(0x9c);  
write_command(0x23);  
write_command(0x9d);  
write_command(0x23);  
write_command(0x9e);  
write_command(0x23);  
write_command(0x9f);  
write_command(0x23);
```

```
write_command(0xa0);  
write_command(0x27);  
write_command(0xa1);  
write_command(0x27);  
write_command(0xa2);  
write_command(0x27);  
write_command(0xa3);  
write_command(0x27);
```

```
write_command(0xa4);  
write_command(0x2b);  
write_command(0xa5);  
write_command(0x2b);  
write_command(0xa6);  
write_command(0x2b);  
write_command(0xa7);  
write_command(0x2b);
```

```
write_command(0xa8);  
write_command(0x2f);  
write_command(0xa9);  
write_command(0x2f);  
write_command(0xaa);  
write_command(0x2f);  
write_command(0xab);  
write_command(0x2f);
```

```
write_command(0xac);  
write_command(0x32);  
write_command(0xad);  
write_command(0x32);  
write_command(0xae);  
write_command(0x32);  
write_command(0xaf);  
write_command(0x32);
```

```
write_command(0xb0);  
write_command(0x35);  
write_command(0xb1);  
write_command(0x35);  
write_command(0xb2);  
write_command(0x35);
```

```
write_command(0xb3);
write_command(0x35);

write_command(0xb4);
write_command(0x38);
write_command(0xb5);
write_command(0x38);
write_command(0xb6);
write_command(0x38);
write_command(0xb7);
write_command(0x38);

write_command(0xb8);
write_command(0x3a);
write_command(0xb9);
write_command(0x3a);
write_command(0xba);
write_command(0x3a);
write_command(0xbb);
write_command(0x3a);

write_command(0xbc);
write_command(0x3c);
write_command(0xbd);
write_command(0x3c);
write_command(0xbe);
write_command(0x3c);
write_command(0xbf);
write_command(0x3c);
    //end settings for 16-level grayscale
write_command(0x38);
write_command(0x74);
write_command(0xaf); //Display ON
}

//-----
```

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



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- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.