

NHD-C128128CZ-FN-GBW

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

| | |
|----------|---------------------------|
| NHD- | Newhaven Display |
| C128128- | 128 x 128 pixels |
| CZ- | Model |
| F- | Transflective |
| N- | No backlight |
| G- | STN-Gray |
| B- | 6:00 view |
| W- | Wide Temp (-20°C ~ +70°C) |
| | RoHS Compliant |

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Document Revision History

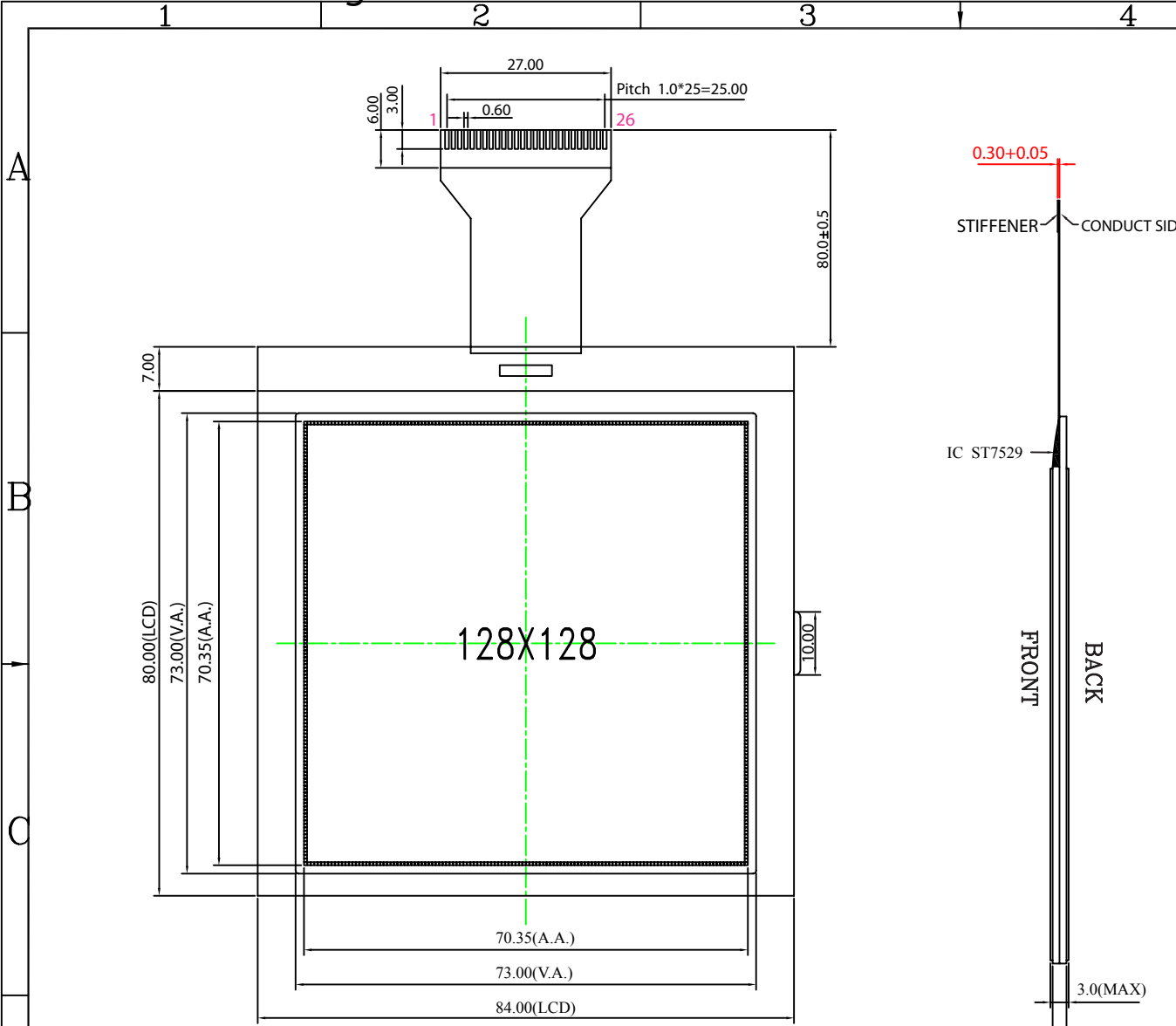
| Revision | Date | Description | Changed by |
|----------|------------|-----------------------------------|------------|
| 0 | 6/17/2007 | Initial Release | - |
| 1 | 8/4/2009 | User guide reformat | BE |
| 2 | 10/14/2009 | Updated Electrical Characteristic | MC |
| | | | |

Functions and Features

- 128 x 128 pixels
- Built-in ST7529 controller
- +3.0V power supply
- 1/128 duty cycle; 1/12 bias
- RoHS Compliant

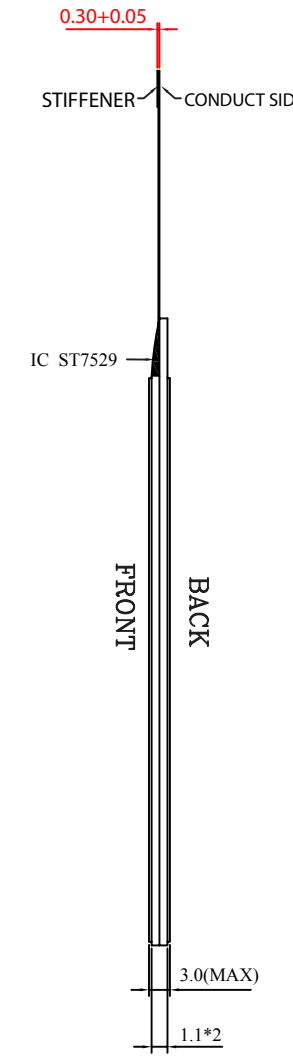
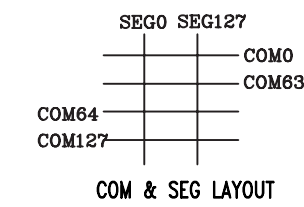
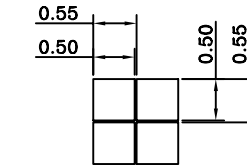
Mechanical Drawing

| REV | DESCRIPTION: | DATE |
|-----|--------------|------|
| | | |



PIN ASSIGNMENT

| NO. | SIGNAL |
|-----|--------|
| 1 | A0 |
| 2 | RW |
| 3 | DB0 |
| 4 | DB1 |
| 5 | DB2 |
| 6 | DB3 |
| 7 | DB4 |
| 8 | DB5 |
| 9 | DB6 |
| 10 | DB7 |
| 11 | E |
| 12 | RST |
| 13 | CSB |
| 14 | VDD |
| 15 | VSS |
| 16 | VDDA |
| 17 | VLCDIN |
| 18 | V4 |
| 19 | V3 |
| 20 | V2 |
| 21 | V1 |
| 22 | V0 |
| 23 | NC |
| 24 | NC |
| 25 | NC |
| 26 | NC |



Specification:

- 1). Driving: 1/128 Duty, 1/12 Bias, Vlcd: 16.0V
- 2). Viewing Direction: 6 O'clock
- 3). Display mode: STN/Positive/Transflective/Gray mode
- 4). Operating temp.: -20°C~+70°C
Storage temp.: -25°C~+75°C
- 5). Driver : ST7529 Vdd:3V
- 6). RoHS Compliant

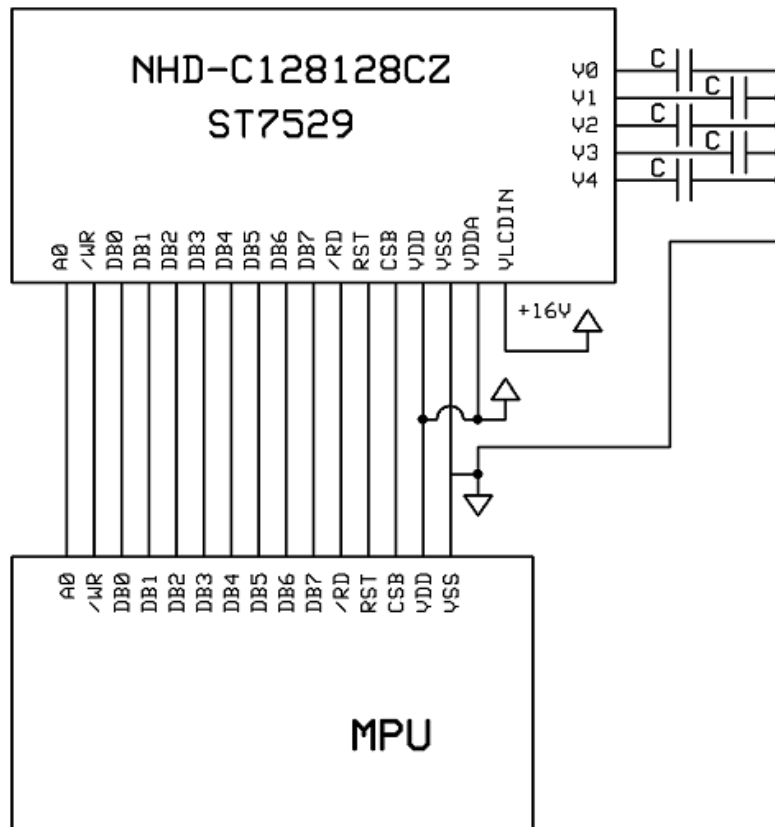
| | | | |
|-------------------------------------|------|------------------|---------------|
| Model Name: NHD-C128128CZ-FN-GBW | | Newhaven Display | |
| GENERAL TOL: ± 0.3 | | | |
| APPROVALS | DATE | DRAWN NO. | SCALE: 1:1 |
| DWN: YE.GUO.XIANG | | | |
| CHK: | | SIZE: A4 | UNIT: mm |
| APP: | | | Page: 1-1 |

Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---------|---------|---------------------|---|
| 1 | A0 | MPU | Register select signal. A0=1: Data, A0=0: Command |
| 2 | /WR | MPU | Active LOW Write signal |
| 3-10 | DB0-DB7 | MPU | Bi-directional 8-bit data bus. |
| 11 | /RD | MPU | Active LOW Read signal |
| 12 | RST | MPU | Active LOW Reset signal |
| 13 | CSB | MPU | Active LOW Chip select |
| 14 | VDD | Power Supply | Power supply for LCD and logic (+3V) |
| 15 | Vss | Power Supply | Ground |
| 16 | VDDA | Power Supply | Power supply for analog circuit (+3V) |
| 17 | VLCDIN | Power Supply | LCD driver supply voltage input (+16V) |
| 18 | V4 | Power Supply | 1.0uF-2.2uF cap to Vss |
| 19 | V3 | Power Supply | 1.0uF-2.2uF cap to Vss |
| 20 | V2 | Power Supply | 1.0uF-2.2uF cap to Vss |
| 21 | V1 | Power Supply | 1.0uF-2.2uF cap to Vss |
| 22 | V0 | Power Supply | 1.0uF-2.2uF cap to Vss |
| 23-26 | NC | - | No Connect |

Recommended LCD connector: 1.0mm pitch, 26 pin FFC. Molex p/n: 52207-2685

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 | -25 | - | +75 | °C |
| Supply Voltage | VDD | | - | 3.0 | - | V |
| Supply Current | IDD | Ta=25°C, VDD=3.0V | - | 0.3 | 0.5 | mA |
| Supply for LCD (contrast) | VDD-V0 | Ta =25 | - | 16.0 | - | 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 |
| | | | | | | |

Optical Characteristics

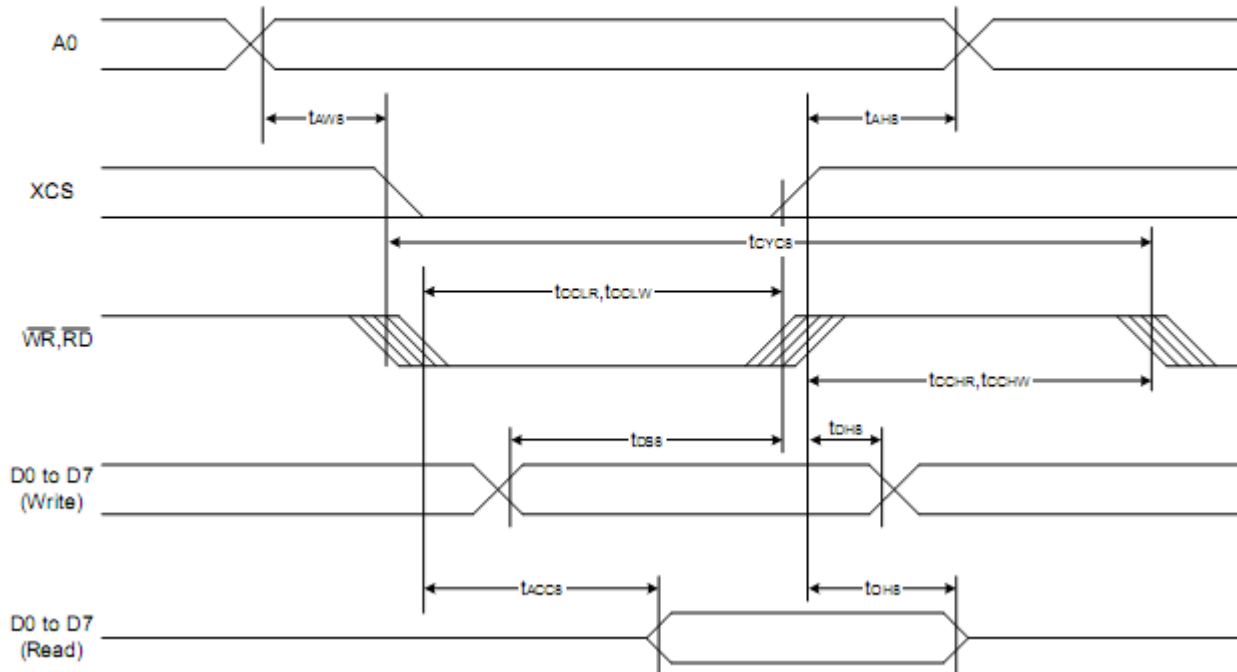
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------------|--------|-----------|------|------|------|------|
| Viewing Angle - Vertical | | Cr≥2 | -60 | - | +35 | ° |
| Viewing Angle - Horizontal | Φ | | -40 | - | +40 | ° |
| Contrast Ratio | CR | | - | 6 | - | - |
| Response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

Controller Information

Built-in ST7529. Download specification at http://www.newhavendisplay.com/app_notes/ST7529.pdf

Timing Characteristics

System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)



| Item | Signal | Symbol | Condition | Rating | | Units |
|------------------------------|----------|--------|-------------|--------|------|-------|
| | | | | Min. | Max. | |
| Address hold time | A0 | tAH8 | - | 20 | - | ns |
| Address setup time | | tAW8 | - | 20 | - | |
| System cycle time | | tCYC8 | - | 200 | - | |
| Enable L pulse width (WRITE) | WR | tCCLW | - | 100 | - | |
| Enable H pulse width (WRITE) | | tCCHW | - | 100 | - | |
| Enable L pulse width (READ) | RD | tCCLR | - | 100 | - | |
| Enable H pulse width (READ) | | tCCHR | - | 100 | - | |
| WRITE Data setup time | D0 to D7 | tDS8 | - | 150 | - | |
| WRITE Address hold time | | tDH8 | - | 20 | - | |
| READ access time | | tACC8 | CL = 100 pF | - | 40 | |
| READ Output disable time | | tOH8 | CL = 100 pF | - | 30 | |

Table of Commands

Ext=0 or Ext=1

| Index | Command | A0 | RD | WR | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Function | Hex | Parameter |
|-------|---------|----|----|----|----|----|----|----|----|----|----|----|-----------|-----|-----------|
| 1 | Ext In | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | Ext=0 Set | 30 | None |
| 2 | Ext Out | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | Ext=1 Set | 31 | None |

| Index | Command | A0 | RD | WR | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Function | Hex | Parameter |
|-------|----------|----|----|----|----|----|----|----|----|----|----|----|-----------------------|-----|-----------|
| 1 | DISON | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | Display On | AF | None |
| 2 | DISOFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | Display Off | AE | None |
| 3 | DISNOR | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | Normal Display | A6 | None |
| 4 | DISINV | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | Inverse Display | A7 | None |
| 5 | COMSCN | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | COM Scan Direction | BB | 1 byte |
| 6 | DISCTRL | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | Display Control | CA | 3 bytes |
| 7 | SLPIN | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | Sleep In | 95 | None |
| 8 | SLPOUT | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | Sleep Out | 94 | None |
| 9 | LASET | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | Line Address Set | 75 | 2 bytes |
| 10 | CASET | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | Column Address Set | 15 | 2 bytes |
| 11 | DATSDR | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | Data Scan Direction | BC | 3 bytes |
| 12 | RAMWR | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | Writing to Memory | 5C | Data |
| 13 | RAMRD | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | Reading from Memory | 5D | Data |
| 14 | PTLIN | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | Partial display in | A8 | 2 bytes |
| 15 | PTLOUT | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | Partial display out | A9 | None |
| 16 | RMWIN | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Read and Modify Write | E0 | None |
| 17 | RMWOUT | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | RMW end | EE | None |
| 18 | ASCSET | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | Area Scroll Set | AA | 4 bytes |
| 19 | SCSTART | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | Scroll Start Set | AB | 1 byte |
| 20 | OSCON | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | Internal OSC on | D1 | None |
| 21 | OSCOFF | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | Internal OSC off | D2 | None |
| 22 | PWRCTRL | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | Power Control | 20 | 1 byte |
| 23 | VOLCTRL | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | EC control | 81 | 2 bytes |
| 24 | VOLUP | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | EC increase 1 | D6 | None |
| 25 | VOLDOWN | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | EC decrease 1 | D7 | None |
| 26 | RESERVED | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Not Use | 82 | 0 |

Ext=0

| | | | | | | | | | | | | | | | | |
|----|---------|---|---|---|-----------|---|---|---|---|---|---|-------------|-----------------|-----------------|------|--------|
| 27 | EPSRRD1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | READ Register1 | 7C | None | |
| 28 | EPSRRD2 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | READ Register2 | 7D | None | |
| 29 | NOP | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | NOP Instruction | 25 | None | |
| 30 | STREAD | 0 | 0 | 1 | Read Data | | | | | | | Status Read | | | | |
| 31 | EPINT | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | Initial code(1) | 07 | 1 byte |

Ext=1

| <i>Index</i> | <i>Command</i> | <i>A0</i> | <i>RD</i> | <i>WR</i> | <i>D7</i> | <i>D6</i> | <i>D5</i> | <i>D4</i> | <i>D3</i> | <i>D2</i> | <i>D1</i> | <i>D0</i> | <i>Function</i> | <i>Hex</i> | <i>Parameter</i> |
|--------------|----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------------------|------------|------------------|
| 1 | Gray 1 Set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | FRAME 1 Gray PWM Set | 20 | 16 bytes |
| 2 | Gray 2 Set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | FRAME 2 Gray PWM Set | 21 | 16 bytes |
| 3 | ANASET | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | Analog Circuit Set | 32 | 3 bytes |
| 4 | SWINT | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | Software Initial | 34 | None |
| 5 | EPCTIN | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | Control EEPROM | CD | 1 byte |
| 6 | EPCOUT | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | Cancel EEPROM | CC | None |
| 7 | EPMWR | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | Write to EEPROM | FC | None |
| 8 | EPMRD | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | Read from EEPROM | FD | None |

Example Initialization Program

```
/******  
void write_command(unsigned char i)  
{  
A0=0; /*Instruction register*/  
E=1; /*Read inactive*/  
P1 = i; /*put data on port 1*/  
CSB=0; /*Chip select active*/  
RW=0; /*Write active*/  
RW=1; /*Write inactive; latch in data*/  
CSB=1; /*Chip select inactive*/  
}  
/******  
/******  
void write_data(unsigned char i)  
{  
A0=1; /*DDRAM data register*/  
E=1;  
P1 = i;  
CSB=0;  
RW=0;  
RW=1;  
CSB=1;  
}  
/******  
/******  
void initEEPROM(void){  
    write_command(0x30); /*ext=0  
    write_command(0x07);  
    write_data(0x19);  
    write_command(0x31); /*ext=1  
    write_command(0xCD);  
    write_data(0x00);  
    delay(8);  
    write_command(0xFD);  
    delay(4);  
    write_command(0xCC);  
    write_command(0x30); /*ext=0  
}  
/******  
/******  
void lcd_init(void){ /*ST7529  
    write_command(0x30); /*extended set off  
        write_command(0x94); /*sleep out  
    write_command(0xD1); /*OCS on  
        delay(2);  
    write_command(0x20); /*power control  
        write_data(0x0B); /*booster  
        delay(8);  
    write_command(0x81); /*electronic control  
        write_data(0x3F); /*vop=14.0v  
        write_data(0x04);  
    write_command(0xCA); /*display control  
        write_data(0x00); /*CL=X1  
        write_data(0x27); /*Duty=128  
    write_data(0x00); /*FR set  
    write_command(0xA7); /*normal display  
    write_command(0xBB); /*com direction  
    write_data(0x01);  
    write_command(0xBC); /*scan direction  
    write_data(0x01); /*normal  
        write_data(0x00); /*RGB arrangement  
        write_data(0x02); /*65k color  
        write_command(0x31); /*ext instruction  
    write_command(0x32); /*analog circuit set  
        write_data(0x06); /*osc frequency  
        write_data(0x01); /*booster efficiency  
        write_data(0x00); /*bias = 1/4  
        write_command(0x22);
```

```

write_data(0x03);
write_data(0x02);
write_data(0x02);
write_command(0x34);           //software init
initEEPROM();
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. | +75°C , 48hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -25°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