

# 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) |
|          | <b>RoHS Compliant</b>     |

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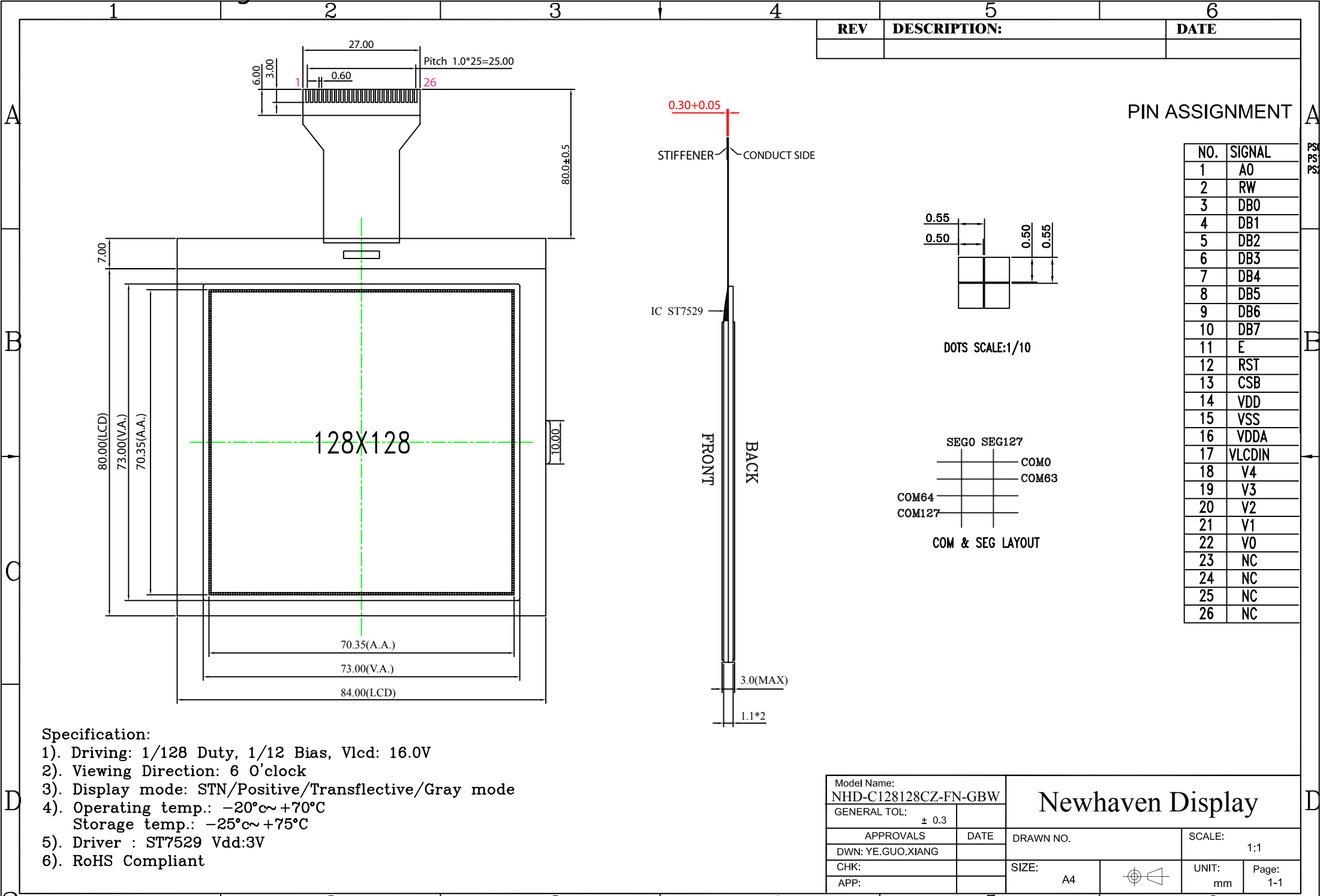
## Document Revision History

| 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         |
|          |            |                                   |            |

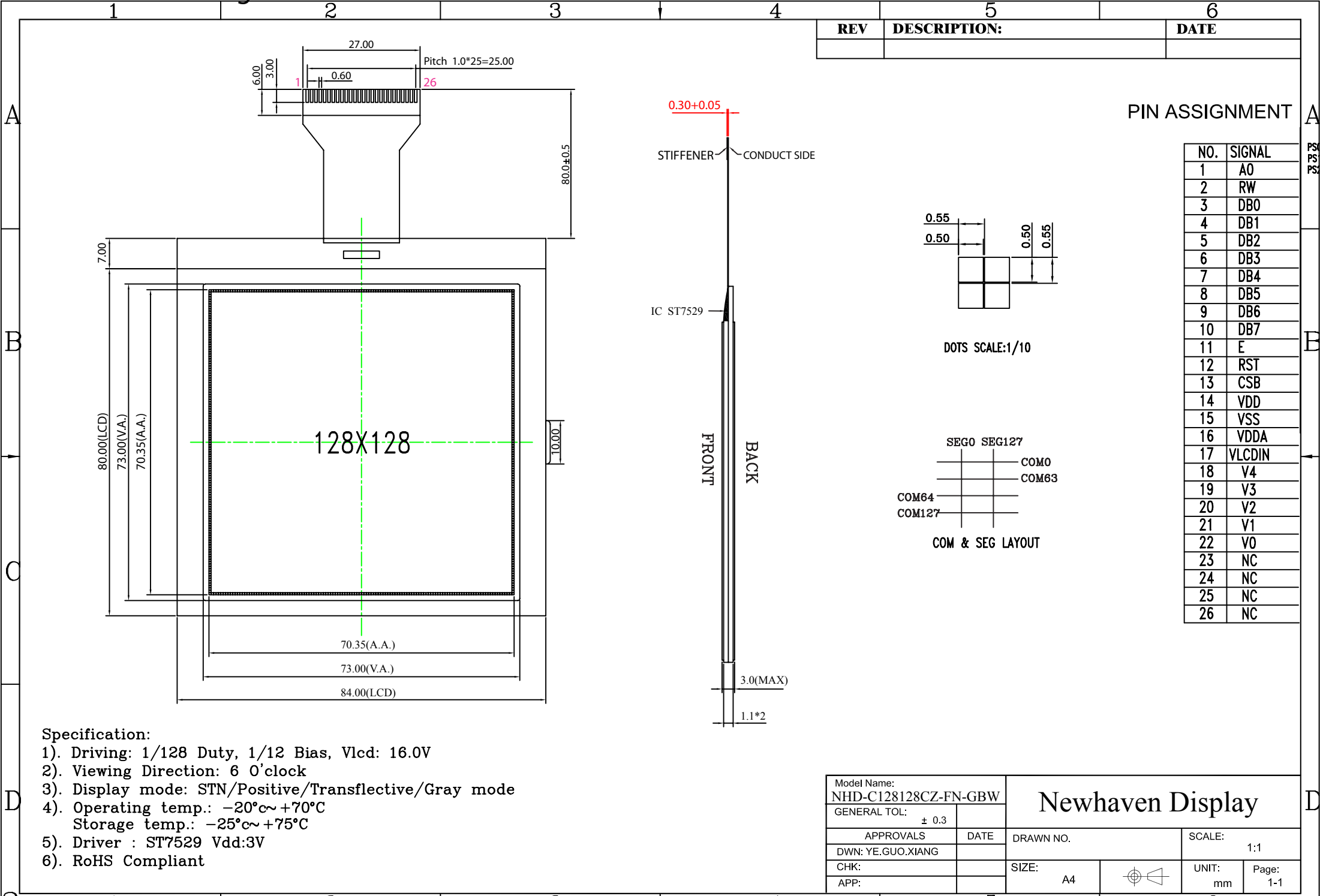
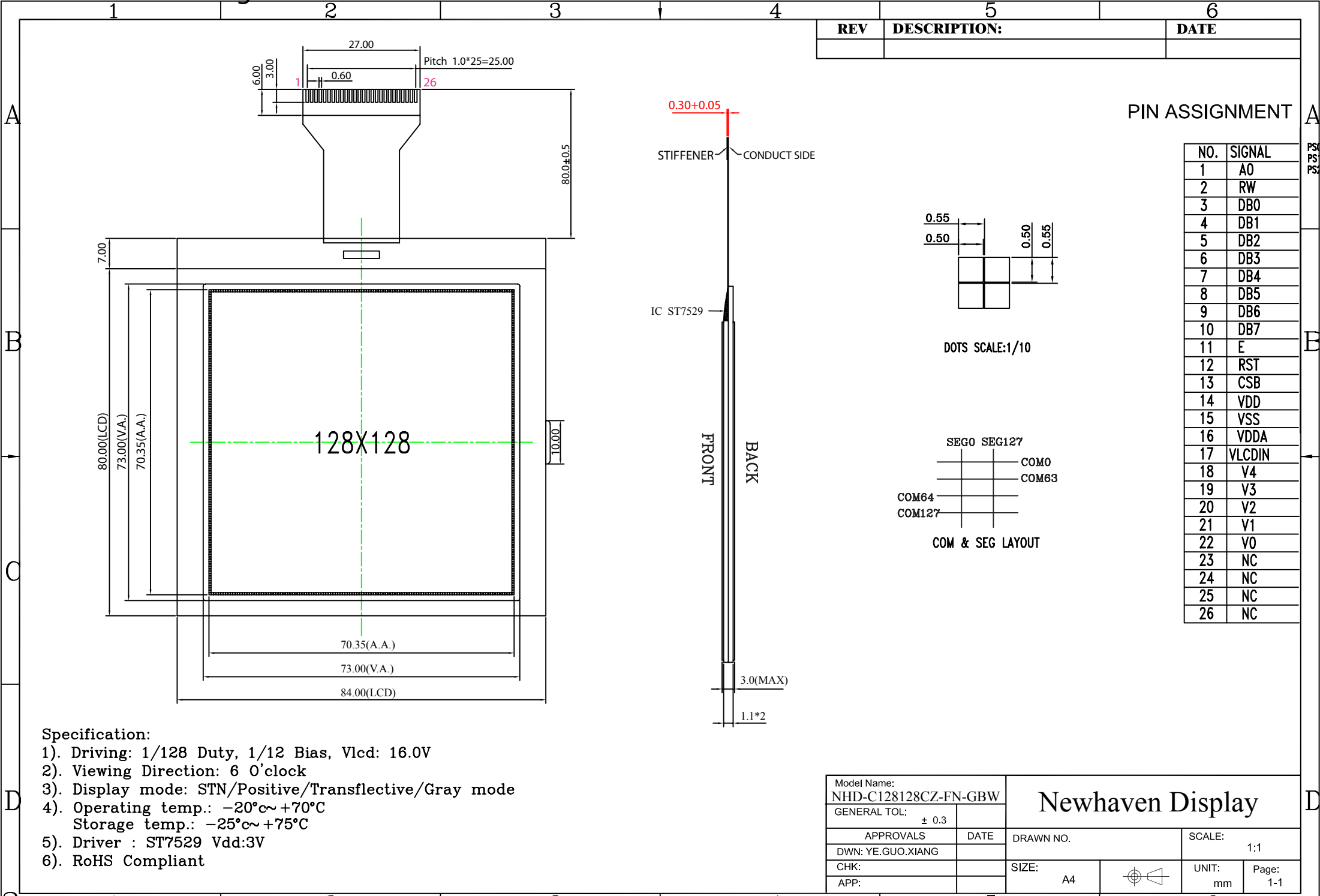
## Functions and Features

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

# Mechanical Drawing



- 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



1 2 3 4 5 6

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:

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- RoHS Compliant

Model Name:  
NHD-C128128CZ-FN-GBW

GENERAL TOL: ± 0.3

APPROVALS DATE

DWN: YE.GUO.XIANG

CHK:

APP:

NEWHAVEN DISPLAY

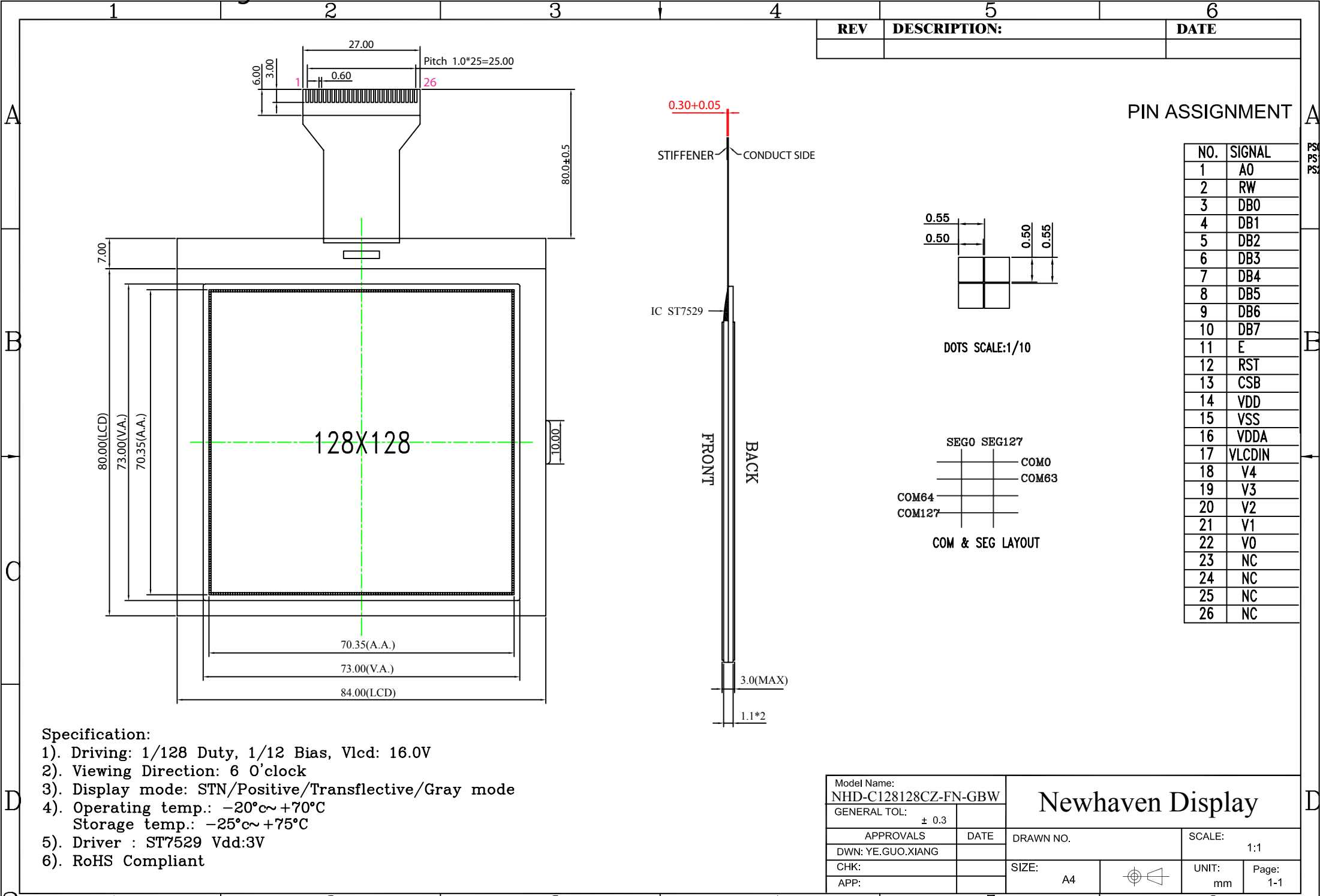
DRAWN NO.

SCALE: 1:1

SIZE: A4

UNIT: mm

Page: 1-1

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**REV**

**DESCRIPTION:**

**DATE**

**PIN ASSIGNMENT**

| NO. | SIGNAL |
|-----|--------|
| 1   | A0     |
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| 8   | DB5    |
| 9   | DB6    |
| 10  | DB7    |
| 11  | E      |
| 12  | RST    |
| 13  | CSB    |
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| 17  | VLCDIN |
| 18  | V4     |
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NHD-C128128CZ-FN-GBW

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**Newhaven Display**

**DRAWN NO.**

**SCALE:** 1:1

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**Page:** 1-1

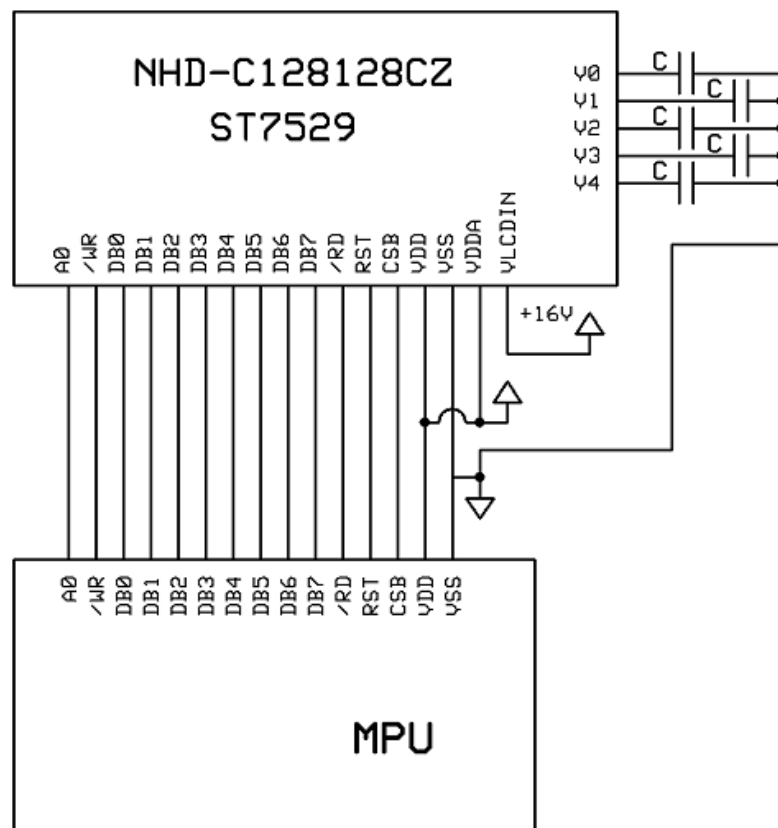
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## Pin Description and Wiring Diagram

| 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,<br>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

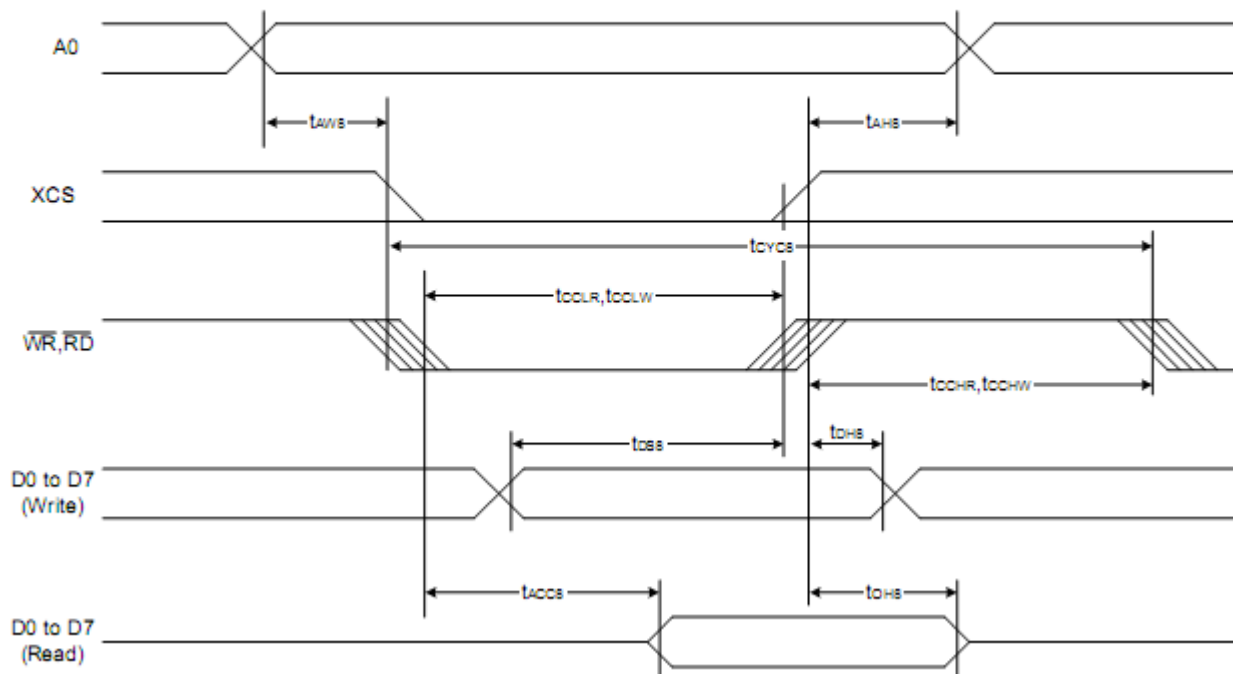
| Item                       | Symbol   | Condition | Min. | Typ. | Max. | Unit |
|----------------------------|----------|-----------|------|------|------|------|
| Viewing Angle - Vertical   | $\theta$ | Cr≥2      | -60  | -    | +35  | °    |
| Viewing Angle - Horizontal | $\Phi$   |           | -40  | -    | +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](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       | $t_{AH8}$  | -           | 20     | -    | ns    |
| Address setup time           |          | $t_{AW8}$  | -           | 20     | -    |       |
| System cycle time            |          | $t_{CYC8}$ | -           | 200    | -    |       |
| Enable L pulse width (WRITE) | WR       | $t_{CCLW}$ | -           | 100    | -    |       |
| Enable H pulse width (WRITE) |          | $t_{CCHW}$ | -           | 100    | -    |       |
| Enable L pulse width (READ)  | RD       | $t_{CCLR}$ | -           | 100    | -    |       |
| Enable H pulse width (READ)  |          | $t_{CCHR}$ | -           | 100    | -    |       |
| WRITE Data setup time        | D0 to D7 | $t_{DS8}$  | -           | 150    | -    |       |
| WRITE Address hold time      |          | $t_{DH8}$  | -           | 20     | -    |       |
| READ access time             |          | $t_{ACC8}$ | CL = 100 pF | -      | 40   |       |
| READ Output disable time     |          | $t_{OH8}$  | 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 | 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<br>10 cycles                        |      |
| Vibration test                        | Endurance test applying vibration to simulate transportation and use.                                                           | 10-55Hz , 15mm amplitude.<br>60 sec in each of 3 directions X,Y,Z<br>For 15 minutes | 3    |
| Static electricity test               | Endurance test applying electric static discharge.                                                                              | VS=800V, RS=1.5kΩ, CS=100pF<br>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](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisplay.com/index.php?main\\_page=terms](http://www.newhavendisplay.com/index.php?main_page=terms)

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