NHD-0116GZ-FSW-GBW

Character Liquid Crystal Display Module

NHD-	Newhaven Display
0116-	1 line x 16 characters
GZ-	Model
F-	Transflective
SW-	Side White LED Backlight
G-	STN- Gray
B-	6:00 view
W-	Wide Temperature (-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.newhavendisplay.com
nhtech@newhavendisplay.com nhsales@newhavendisplay.com

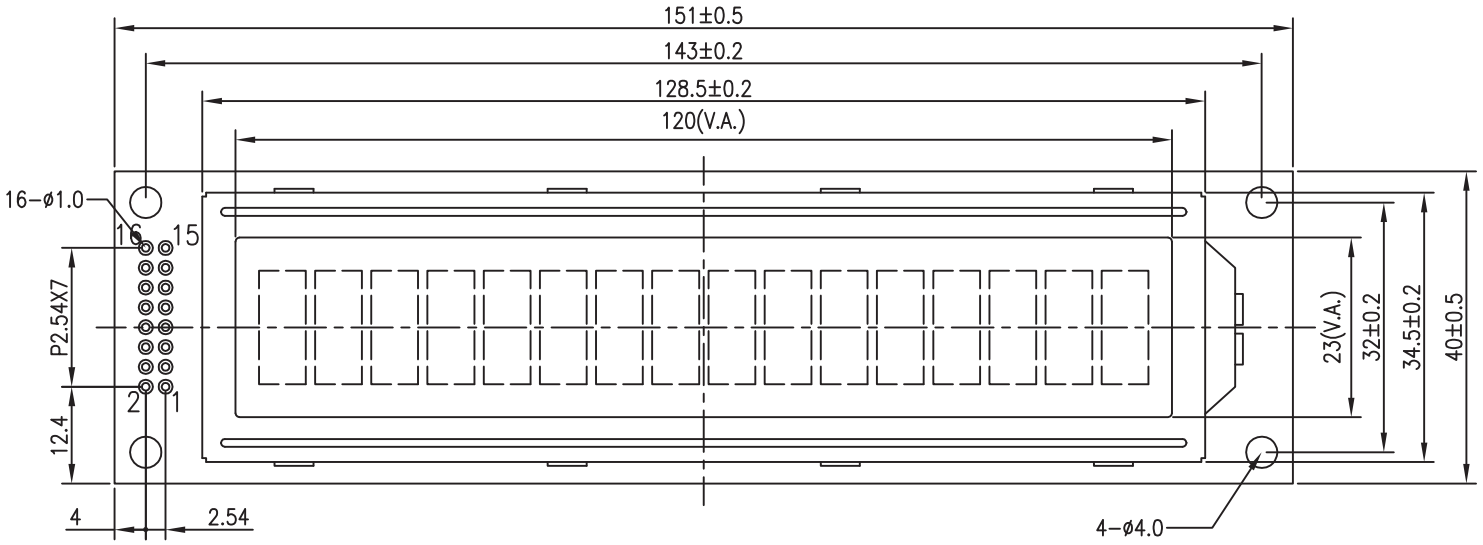
Document Revision History

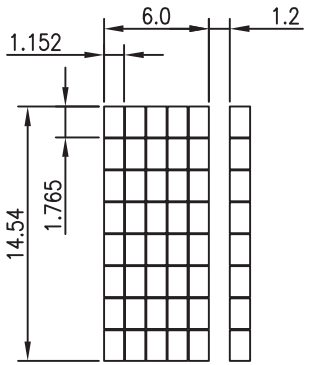
Revision	Date	Description	Changed by
0	**9/25/2007**	**Initial Release**	**-**
1	**11/6/2009**	**User Guide Reformat**	**BE**
2	**12/8/2009**	**Pin description updated**	**BE**
3	**1/5/2010**	**Optical revised**	**BE**
4	**1/5/2011**	**Alternate controller information updated**	**AK**

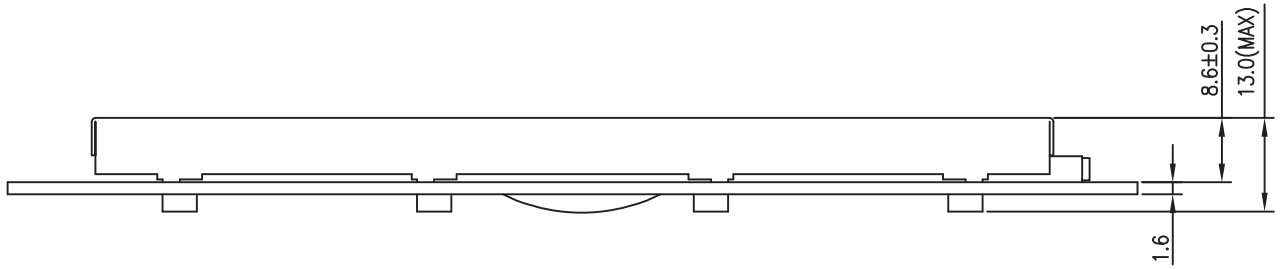
Functions and Features

- **1 line x 16 characters**
- **Built-in controller (SPLC780D or ST7066U)**
- **+5.0V Power Supply**
- **1/16 duty, 1/5 bias**
- **RoHS compliant**

Mechanical Drawing







PIN ASSIGNMENT

1	VSS
2	VDD
3	V0
4	RS
5	R/W
6	E
7~14	DB0~DB7
15	LED+
16	LED-

Notes:

1). Driver Method: 1/16duty, 1/5bias, VDD5.0V VLCD4.5V
2). Display Type: STN-Gray/Positive/Transflective/6:00 Visual Angle
3). Operating Temp: -20°C~70°C/Storage Temp: -30°C~80°C
4). Backlight Type: Side White/Vled5.0V/30mA
5). Driver: SPLC780D or ST7066U
6). RoHS Compliant

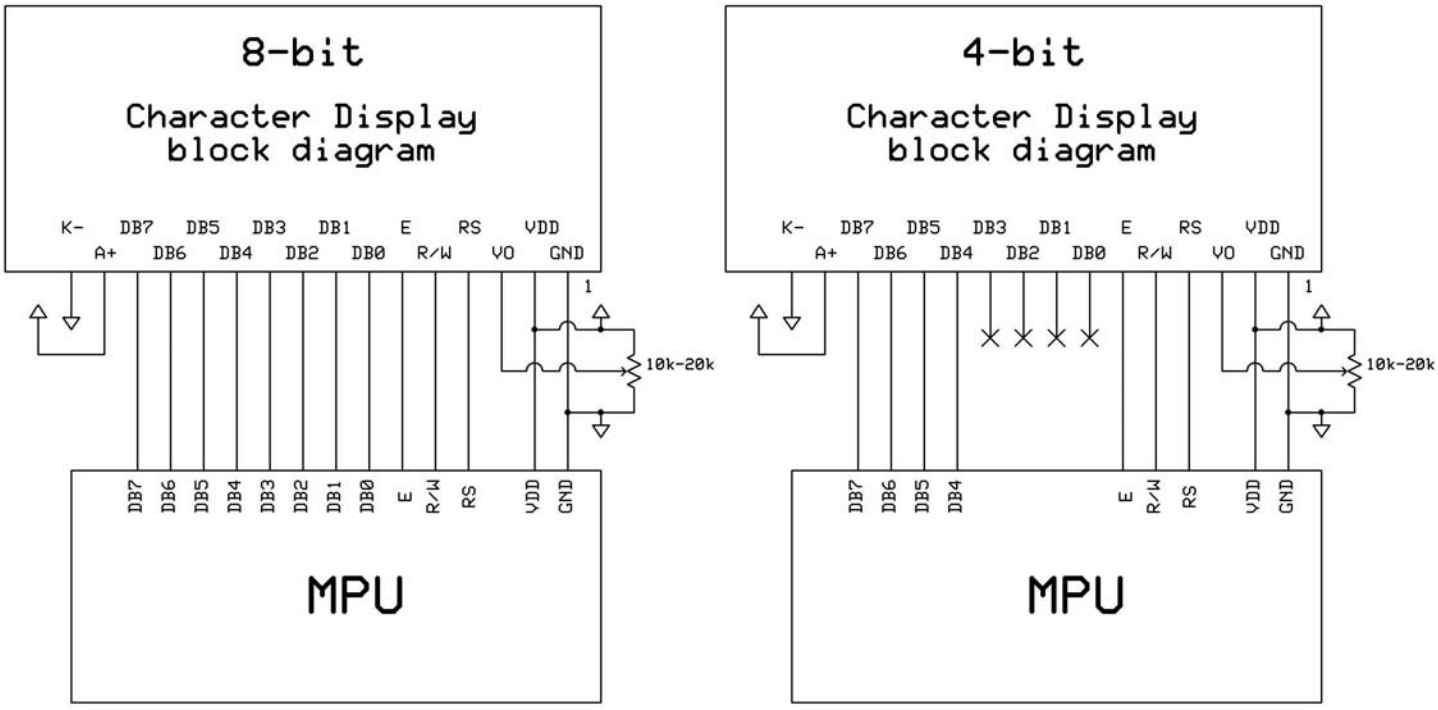
Newhaven Display

Part No.	NHD-0116GZ-FSW-GBW

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VSS	Power Supply	Ground
2	VDD	Power Supply	Supply Voltage for logic (+5.0V)
3	V0	Adj Power Supply	Power supply for contrast (approx. 0.5V)
4	RS	MPU	Register select signal. RS=0: Command, RS=1: Data
5	R/W	MPU	Read/Write select signal, R/W=1: Read R/W: =0: Write
6	E	MPU	Operation enable signal. Falling edge triggered.
7-10	DB0 – DB3	MPU	Four low order bi-directional three-state data bus lines. These four are not used during 4-bit operation.
11-14	DB4 – DB7	MPU	Four high order bi-directional three-state data bus lines.
15	LED+	Power Supply	Power supply for LED Backlight (+5.0V via on-board resistor)
16	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		4.7	5.0	5.5	V
Supply Current	IDD	Ta=25°C, VDD=5.0V	-	1.5	2.5	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	-	4.5	-	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
Backlight Supply Voltage	Vled	-	-	5.0	-	V
Backlight Supply Current	Iled	Vled=5.0V	-	30	-	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle – Vertical (top)	AV	Cr ≥ 2	-	25	-	º
Viewing Angle – Vertical (bottom)	AV	Cr ≥ 2	-	70	-	º
Viewing Angle – Horizontal (left)	AH	Cr ≥ 2	-	30	-	º
Viewing Angle – Horizontal (right)	AH	Cr ≥ 2	-	30	-	º
Contrast Ratio	Cr		-	2	-	-
Response Time (rise)	Tr	-	-	120	150	ms
Response Time (fall)	Tf	-	-	120	150	ms

Controller Information

Built-in SPLC780D. Download specification at http://www.newhavendisplay.com/app_notes/SPLC780D.pdf

Built-in ST7066U. Download specification at http://www.newhavendisplay.com/app_notes/ST7066U.pdf

Display Character Address Code:

Display position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DDRAM address	00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

Built-in Font Table

Example Initialization Program

```
8-bit Initialization:
/*********************************************************/
void command(char i)
{
      P1 = i;                       //put data on output Port
      D_I =0;                       //D/I=LOW : send instruction
      R_W =0;                       //R/W=LOW : Write
      E  = 1;
      Delay(1);                     //enable pulse width  >= 300ns
        E  = 0;                     //Clock enable: falling edge
}
/*********************************************************/
void write(char i)
{
      P1 = i;                       //put data on output Port
      D_I =1;                       //D/I=LOW : send data
      R_W =0;                       //R/W=LOW : Write
      E  = 1;
      Delay(1);                     //enable pulse width  >= 300ns
      E  = 0;                       //Clock enable: falling edge
}
/*********************************************************/
void init()
{
      E = 0;
      Delay(100);                   //Wait >15 msec after power is applied
      command(0x30);                //command 0x30 = Wake up
      Delay(30);                    //must wait 5ms, busy flag not available
      command(0x30);                //command 0x30 = Wake up #2
      Delay(10);                    //must wait 160us, busy flag not available
      command(0x30);                //command 0x30 = Wake up #3
      Delay(10);                    //must wait 160us, busy flag not available
      command(0x38);                //Function set: 8-bit/2-line
      command(0x10);                //Set cursor
      command(0x0c);                //Display ON; Cursor ON
      command(0x06);                //Entry mode set
}
/*********************************************************/
```

4-bit Initialization:

```
/*********************************************************/
void command(char i)
{
      P1 = i;                       //put data on output Port
      D_I =0;                       //D/I=LOW : send instruction
      R_W =0;                       //R/W=LOW : Write
      Nybble();                     //Send lower 4 bits
      i = i<<4;                     //Shift over by 4 bits
      P1 = i;                       //put data on output Port
      Nybble();                     //Send upper 4 bits
}
/*********************************************************/
void write(char i)
{
      P1 = i;                       //put data on output Port
      D_I =1;                       //D/I=HIGH : send data
      R_W =0;                       //R/W=LOW : Write
      Nybble();                     //Clock lower 4 bits
      i = i<<4;                     //Shift over by 4 bits
      P1 = i;                       //put data on output Port
      Nybble();                     //Clock upper 4 bits
}
/*********************************************************/
void Nybble()
{
      E = 1;
      Delay(1);                     //enable pulse width  >= 300ns
      E = 0;                        //Clock enable: falling edge
}
/*********************************************************/
void init()
{
      P1 = 0;
      P3 = 0;
      Delay(100);                   //Wait >15 msec after power is applied
      P1 = 0x30;                    //put 0x30 on the output port
      Delay(30);                    //must wait 5ms, busy flag not available
      Nybble();                     //command 0x30 = Wake up
      Delay(10);                    //must wait 160us, busy flag not available
      Nybble();                     //command 0x30 = Wake up #2
      Delay(10);                    //must wait 160us, busy flag not available
      Nybble();                     //command 0x30 = Wake up #3
      Delay(10);                    //can check busy flag now instead of delay
      P1= 0x20;                     //put 0x20 on the output port
      Nybble();                     //Function set: 4-bit interface
      command(0x28);                //Function set: 4-bit/2-line
      command(0x10);                //Set cursor
      command(0x0F);                //Display ON; Blinking cursor
      command(0x06);                //Entry Mode set
}
/*********************************************************/
```

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