

# NHD-0208BZ-FSW-GBW-3V3

## Character Liquid Crystal Display Module

NHD-	Newhaven Display
0208-	2 lines x 8 characters
BZ-	Model
F-	Transflective
SW-	Side White LED Backlight
G-	STN- Gray
B-	6:00 view
W-	Wide Temperature (-20°C~+70°C)
3V3-	3 VDD, 3 Volt Backlight
	<b>RoHS Compliant</b>

**Newhaven Display International, Inc.**

2511 Technology Drive, Suite 101  
Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

[www.newhavendisplay.com](http://www.newhavendisplay.com)

[nhtech@newhavendisplay.com](mailto:nhtech@newhavendisplay.com)

[nhsales@newhavendisplay.com](mailto:nhsales@newhavendisplay.com)

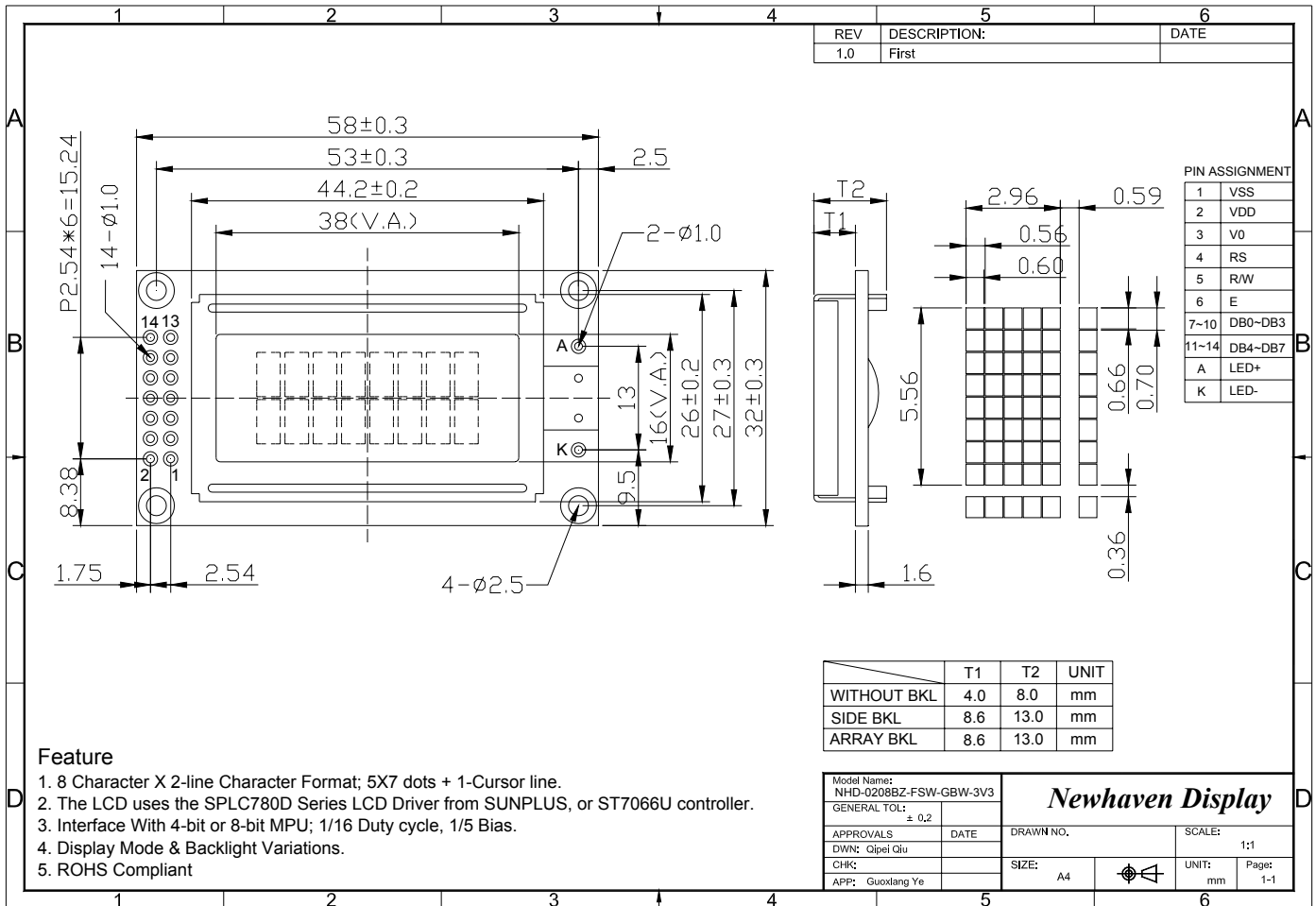
## Document Revision History

Revision	Date	Description	Changed by
0	11/5/2008	Initial Release	-
1	10/7/2009	User Guide Reformat	BE
2	11/3/2009	Block Diagram Revision	BE
3	11/13/2009	Mechanical drawing update	BE
4	11/25/2009	Optical/backlight update	BE
5	12/29/2009	Optical updated	BE
6	1/5/2011	Alternate controller information updated	AK

## Functions and Features

- 2 lines x 8 characters
- Built-in controller (SPLC780D or ST7066U)
- +3.0V Power Supply
- 1/16 duty, 1/5 bias
- RoHS compliant

# Mechanical Drawing

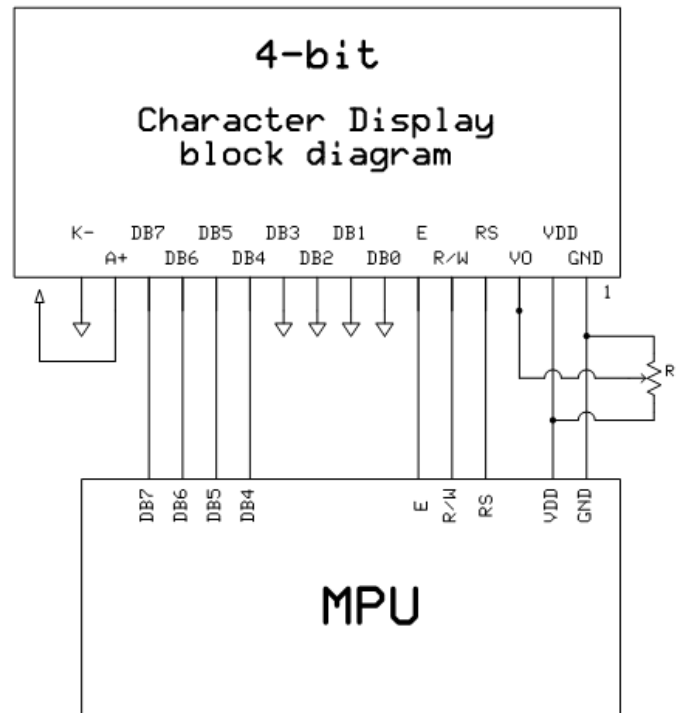
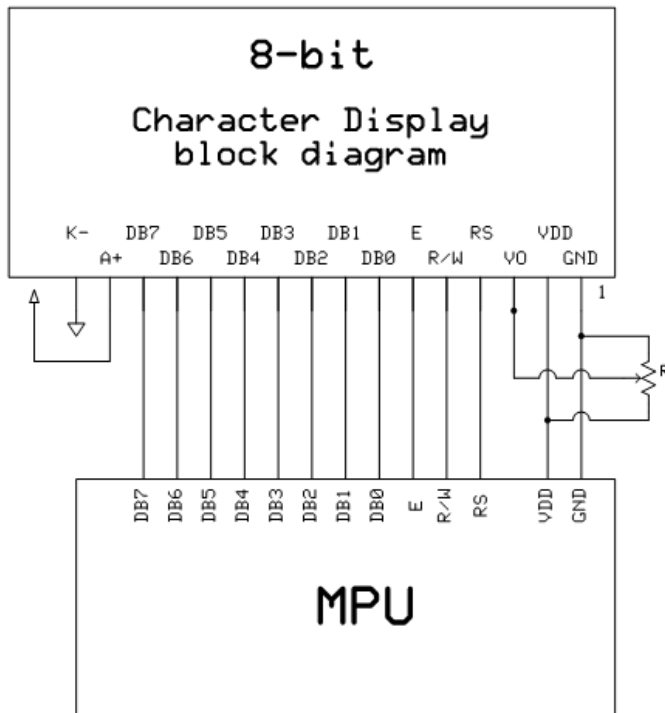


## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VSS	Power Supply	Ground
2	VDD	Power Supply	Supply Voltage for logic (+3.0V)
3	VO	Adj Power Supply	Power supply for contrast (approx. 0V)
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.
A	LED+	Power Supply	Power supply for LED Backlight (+3.0V)
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		2.7	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	-	3.0	-	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
Backlight Supply Voltage	Vled	-	-	3.0	-	V
Backlight Supply Current	Iled	Vled=3.0V	-	15	25	mA

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical (top)	AV	Cr ≥ 2	-	25	-	°
Viewing Angle - Vertical (bottom)	AV	Cr ≥ 2	-	70	-	°
Viewing Angle - Horizontal (left)	AH	Cr ≥ 2	-	30	-	°
Viewing Angle - Horizontal (right)	AH	Cr ≥ 2	-	30	-	°
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](http://www.newhavendisplay.com/app_notes/SPLC780D.pdf)

Built-in ST7066U. Download specification at [http://www.newhavendisplay.com/app\\_notes/ST7066U.pdf](http://www.newhavendisplay.com/app_notes/ST7066U.pdf)

DDRAM address:

								Display position
1	2	3	4	5	6	7	8	
00	01	02	03	04	05	06	07	
40	41	42	43	44	45	46	47	

DDRAM address

## Built-in Font Table

Lower 4 Bits \ Upper 4 Bits	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)			0	a	P	`	P				-	タ	ミ	&	P
xxxx0001	(2)		!	1	A	Q	a	q			。	ア	チ	△	ä	q
xxxx0010	(3)		"	2	B	R	b	r			「	イ	ツ	×	ß	θ
xxxx0011	(4)		#	3	C	S	c	s			」	ウ	テ	モ	ε	ε
xxxx0100	(5)		\$	4	D	T	d	t			、	エ	ト	ト	μ	ε
xxxx0101	(6)		%	5	E	U	e	u			・	オ	ナ	1	ε	ü
xxxx0110	(7)		&	6	F	V	f	v			ヲ	カ	ニ	ヨ	ρ	π
xxxx0111	(8)		'	7	G	W	g	w			ア	キ	ヌ	ラ	g	π
xxxx1000	(1)		(	8	H	X	h	x			イ	ク	ネ	リ	√	×
xxxx1001	(2)		)	9	I	Y	i	y			ウ	ケ	ル	ル	'	γ
xxxx1010	(3)		*	:	J	Z	j	z			エ	コ	ハ	レ	j	π
xxxx1011	(4)		+	;	K	[	k	[			オ	サ	ヒ	ロ	*	π
xxxx1100	(5)		,	<	L	¥	l	l			カ	シ	フ	ク	φ	π
xxxx1101	(6)		-	=	M	]	m	)			ユ	ス	ハ	ン	ε	÷
xxxx1110	(7)		.	>	N	^	n	→			ヨ	セ	ホ	°	ñ	
xxxx1111	(8)		/	?	O	_	o	←			ツ	リ	マ	°	ö	■

## 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;                //enable pulse width >= 300ns
    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](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)