NHD-0216BZ-FL-YBW

Character Liquid Crystal Display Module

NHD-	Newhaven Display
0216-	2 lines x 16 characters
BZ-	Model
F-	Transflective
L-	Yellow/Green LED Backlight
Y-	STN- Yellow/Green
B-	6:00 view
W-	Wide Temperature (-20°C~+70°C)
	RoHS Compliant

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Document Revision History

Revision	Date	Description	Changed by
0	3/3/2009	Initial Release	-
1	12/21/2009	User Guide Reformat	BE
2	1/7/2010	Optical revised	BE
3	1/6/2011	Alternate controller information updated	AK

Functions and Features

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

Mechanical Drawing
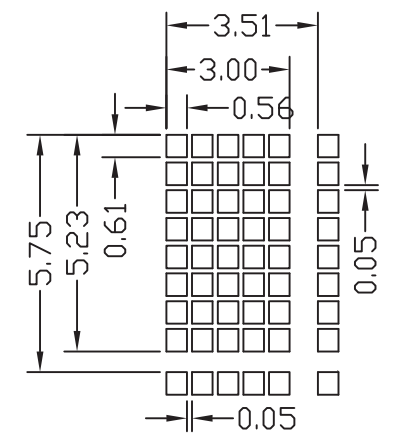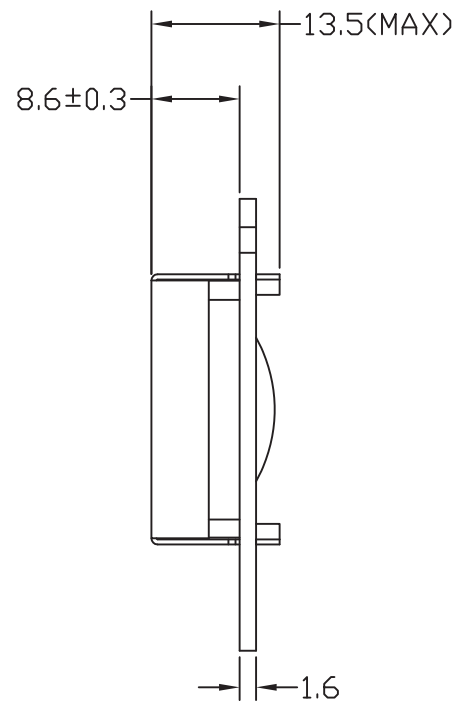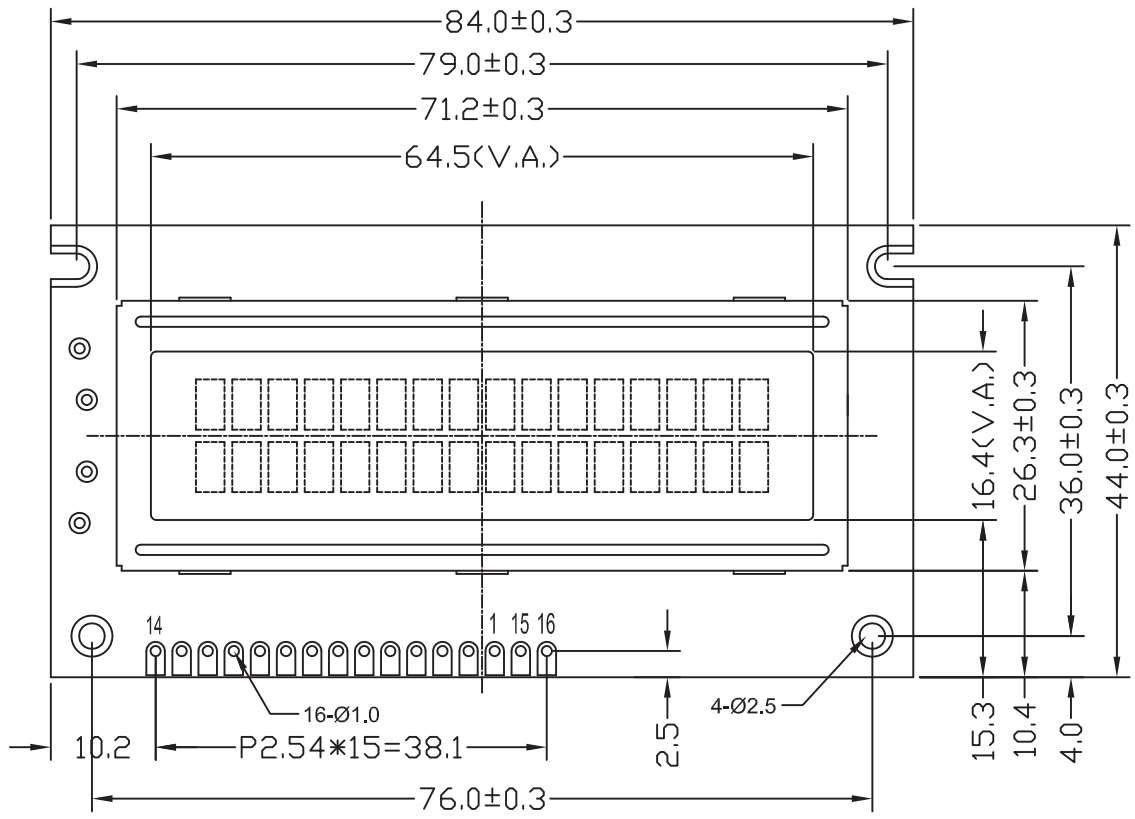
Notes:
1). Driver Method: 1/16duty, 1/5bias, VDD5.0V VLCD4.5V
2). Display Type: STN-YG/Positive/Transflective/6:00 Visual Angle
3). Operating Temp: -20°C~70°C/Storage Temp: -30°C~80°C
4). Backlight Type:Yellow-green/Vled5.0V/120mA
5). Driver: SPLC780D or ST7066U
6). RoHS Compliant

PIN NAME

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

Newhaven Display

Part No.	NHD-0216BZ-FL-YBW

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	-	120	-	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

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

Display character address code:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

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	@	P	`	p				─	9	ミ	α	p
xxxx0001	(2)		!	1	A	Q	a	q			。	ア	チ	ム	ä	q
xxxx0010	(3)		"	2	B	R	b	r			「	イ	ツ	メ	β	θ
xxxx0011	(4)		#	3	C	S	c	s			」	ウ	テ	モ	ε	∞
xxxx0100	(5)		$	4	D	T	d	t			、	エ	ト	ヤ	μ	Ω
xxxx0101	(6)		%	5	E	U	e	u			・	オ	ナ	ユ	σ	ü
xxxx0110	(7)		&	6	F	V	f	v			ヲ	カ	ニ	ヨ	ρ	Σ
xxxx0111	(8)		'	7	G	W	g	w			ア	キ	ヌ	ラ	g	π
xxxx1000	(1)		(	8	H	X	h	x			イ	ク	ネ	リ	√	x̄
xxxx1001	(2)		)	9	I	Y	i	y			ゥ	ケ	ノ	ル	ˉ¹	y
xxxx1010	(3)		*	:	J	Z	j	z			エ	コ	ハ	レ	j	￥
xxxx1011	(4)		+	;	K	[	k	{			オ	サ	ヒ	ロ	×	万
xxxx1100	(5)		,	<	L	¥	l	|			ャ	シ	フ	ワ	¢	円
xxxx1101	(6)		-	=	M	]	m	}			ュ	ス	ヘ	ン	£	÷
xxxx1110	(7)		.	>	N	^	n	→			ョ	セ	ホ	゛	ñ	
xxxx1111	(8)		/	?	O	_	o	←			ッ	ソ	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;
      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