

NHD-0216K1Z-FSR-FBW-L

Character Liquid Crystal Display Module

NHD-	Newhaven Display
0216-	2 lines x 16 characters
K1Z-	Model
F-	Transflective
SR-	Side Red LED Backlight
F-	FSTN(+)
B-	6:00 view
W-	Wide Temperature (-20°C~+70°C)
L-	Low Power 20mA
	RoHS Compliant

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Document Revision History

Revision	Date	Description	Changed by
0	10/5/2007	Initial Release	-
1	12/16/2009	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

REV	DESCRIPTION:	DATE
1.0		

The main drawing shows the LCD module with dimensions in millimeters. The top view includes overall width of 80.0±0.5mm, height of 36.0±0.5mm, and pin pitch of 2.54mm. The side view shows a thickness of 1.6mm. A detailed view of the pin header shows 16 pins with specific widths.

PIN ASSIGNMENT

1	GND
2	VDD
3	V0
4	RS
5	RW
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	LED+
16	LED-

Display Pattern

The display pattern shows a 16x2 pixel grid. Dimensions include 0.51mm for the first row, 3.00mm for the first column, and 0.56mm for the first row height. The total width is 5.23mm and the total height is 0.52mm.

Mechanical Thickness

THICKNESS	T1	T2
W/O BKL	4.6	9.5
With edge BKL	8.6	13.5
With matrix BKL	8.6	13.5

Specification:

- Driving: Duty:1/16, Bias:1/5, VLCD:4.5V, VDD:5.0V
- Viewing Direction: 6 o'clock
- Display mode: FSTN(+)
- Operating temp.: -20°C~+70°C
Storage temp.: -30°C~+80°C
- Driver : S6A0069 or ST7066 or SPLC780D
- Backlight: Side Red

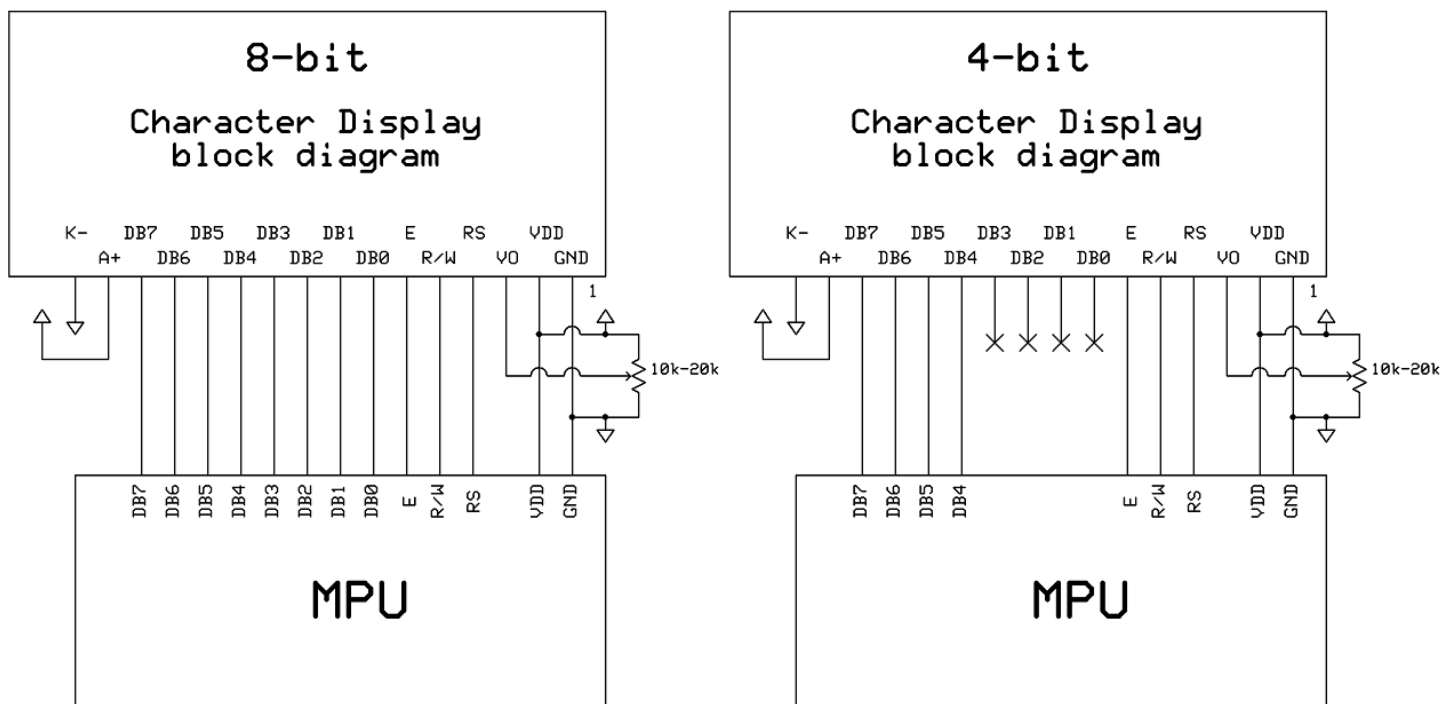
Model Name: NHD-0216K1Z-FSR-FBW-L		Newhaven Display	
GENERAL TOL: ± 0.3			
APPROVALS	DATE	DRAWN NO.	SCALE: 1:1
DWN:		SIZE: A4	UNIT: mm Page: 1-1
CHK:			
APP:			

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	VO	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	-	20	-	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle – Vertical (top)	AV	Cr ≥ 3	-	20	-	°
Viewing Angle – Vertical (bottom)	AV	Cr ≥ 3	-	50	-	°
Viewing Angle – Horizontal (left)	AH	Cr ≥ 3	-	30	-	°
Viewing Angle – Horizontal (right)	AH	Cr ≥ 3	-	30	-	°
Contrast Ratio	Cr		3	5	-	-
Response Time (rise)	Tr	-	-	150	250	ms
Response Time (fall)	Tf	-	-	150	250	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	≡	α	p
xxxx0001	(2)			!	1	A	Q	a	q			。	ア	チ	厶	ä	q
xxxx0010	(3)			"	2	B	R	b	r			「	イ	ツ	×	ß	θ
xxxx0011	(4)			#	3	C	S	c	s			」	ウ	テ	モ	ε	∞
xxxx0100	(5)			\$	4	D	T	d	t			、	エ	ト	ト	μ	Ω
xxxx0101	(6)			%	5	E	U	e	u			・	オ	ナ	1	ε	ü
xxxx0110	(7)			&	6	F	V	f	v			ヲ	カ	ニ	ヨ	ρ	Σ
xxxx0111	(8)			'	7	G	W	g	w			ア	キ	ヌ	ウ	g	π
xxxx1000	(1)			(	8	H	X	h	x			イ	ク	ネ	リ	、	æ
xxxx1001	(2)			)	9	I	Y	i	y			ウ	ケ	ル	ル	、	y
xxxx1010	(3)			*	:	J	Z	j	z			エ	コ	ハ	レ	j	チ
xxxx1011	(4)			+	;	K	[	k	{			オ	サ	ヒ	ロ	×	ヲ
xxxx1100	(5)			,	<	L	¥	l	l			ヤ	シ	フ	ワ	¢	円
xxxx1101	(6)			-	=	M	]	m	}			ユ	ス	ハ	ン	も	÷
xxxx1110	(7)			。	>	N	^	n	→			ヨ	セ	ホ	°	ñ	
xxxx1111	(8)			/	?	O	_	o	€			ッ	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;
    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

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