NHD-12232AZ-FSW-GBW

Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12232-	122 x 32 Pixels
AZ-	Model
F-	Transflective
SW-	Side White LED Backlight
G-	STN Positive, Gray
B-	6:00 Optimal View
W-	Wide Temperature
	RoHS Compliant

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Document Revision History

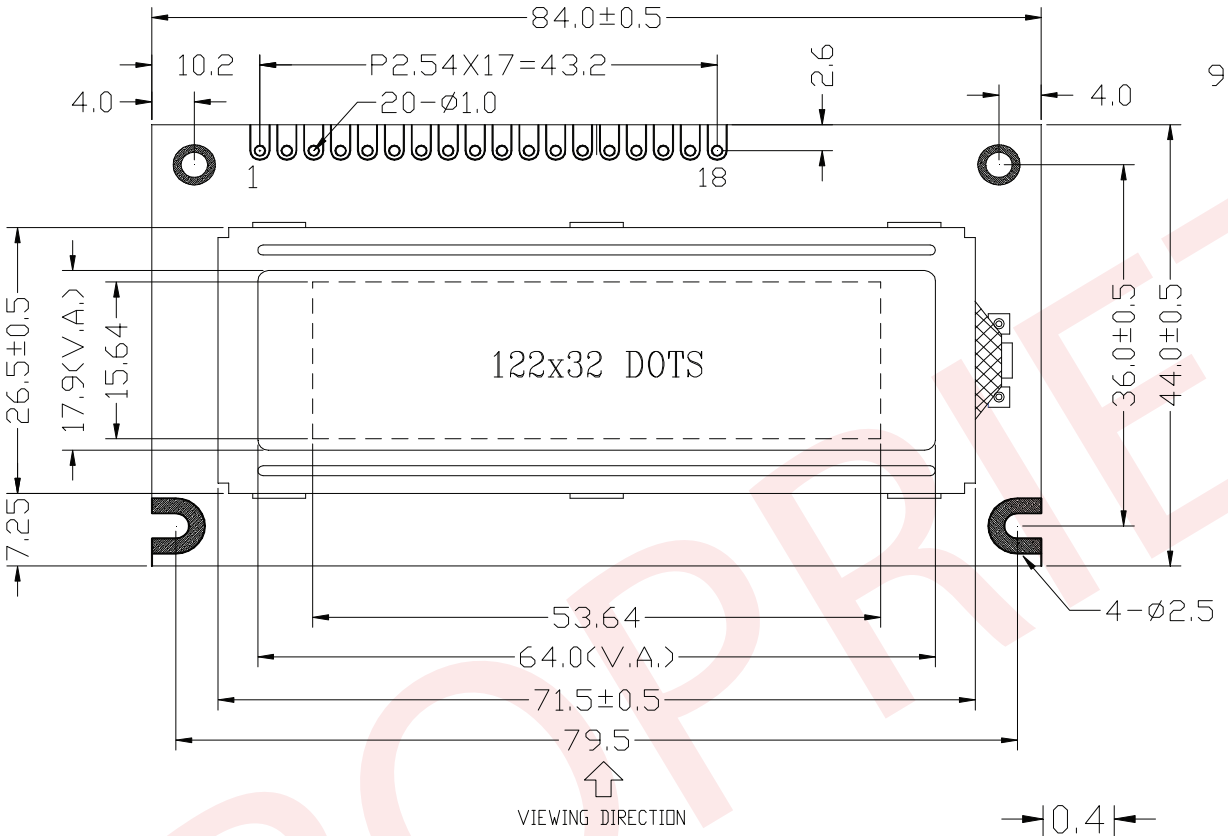
Revision	Date	Description	Changed by
0	10/22/08	Initial Release	-
1	3/16/10	User guide reformat	BE
2	4/15/10	Controller update	BE
3	8/5/10	Electrical Characteristics Update	MP
4	6/2/11	Mechanical drawing updated	AK
5	10/25/11	Electrical characteristics updated	AK
6	1/27/12	Pin description updated	AK
7	4/19/12	Sample code updated	SB
8	7/27/15	Mechanical Drawing, Controller Information Updated, Electrical and Optical Characteristics Updated, Table of Commands	SB
9	9/26/16	Updated Electrical & Optical Characteristics	SB
10	6/27/17	Mechanical Drawing & Backlight Characteristics Updated	SB
11	7/19/17	Bezel Tolerance Updated	SB

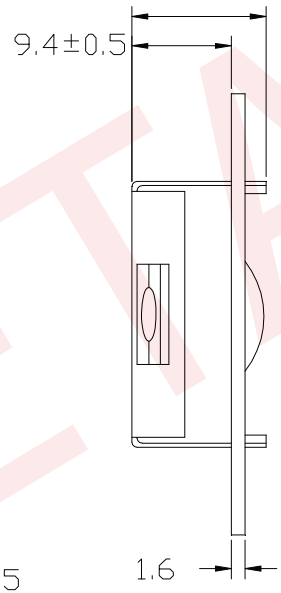
Functions and Features

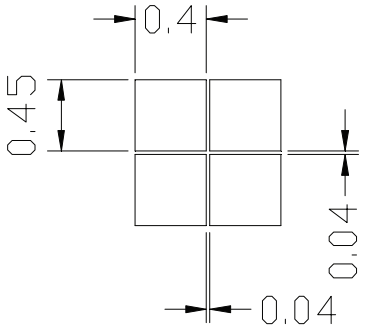
- **122 x 32 pixels**
- **Built-in SBN1661G_M18 Controller**
- **+5.0V power supply**
- **1/32 duty cycle; 1/6 bias**
- **RoHS Compliant**

Mechanical Drawing

Rev	Description	Date







PIN ASSIGNMENT

1	VSS
2	VDD
3	V0
4	RST
5	E1
6	E2
7	R/W
8	A0
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6
16	DB7
17	LED+
18	LED-

Notes:

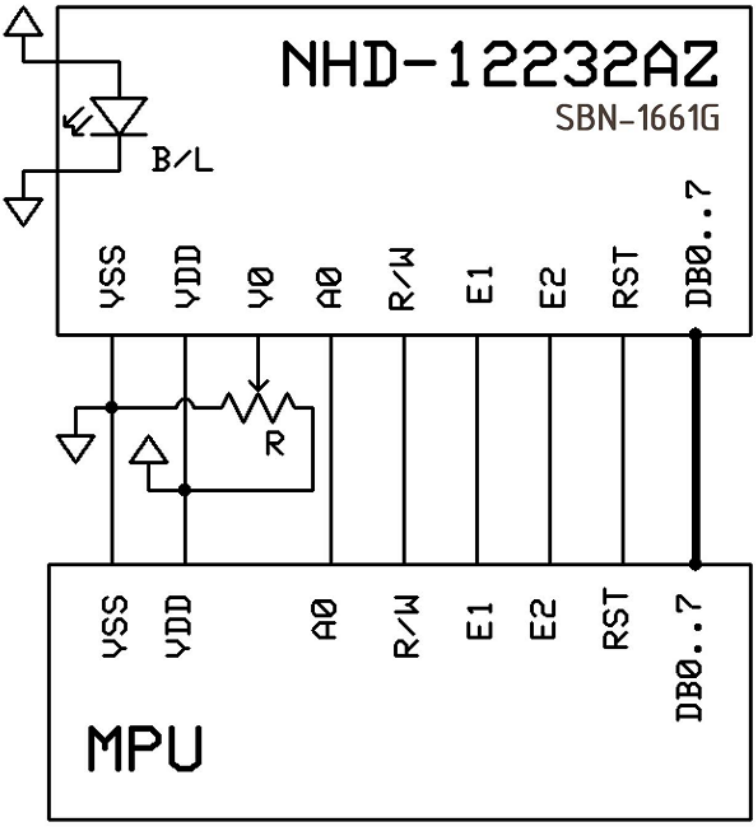
1. Driver:	1/32 Duty, 1/6 Bias
2. Display Mode:	STN Positive / Gray / Transflective
3. Optimal View:	6:00
4. Voltage:	5.0V V_{DD}, 4.5V V_{LCD}
5. Backlight:	White LED
6. Driver IC:	SBN1661G-M18

Unit		
mm	NEWHAVEN DISPLAY INTERNATIONAL	
Gen. Tol.	Date	Part Number:
±0.3	07/19/17	NHD-12232AZ-FSW-GBW

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V_{SS}	Power Supply	Ground
2	V_{DD}	Power Supply	Supply Voltage for logic (+5.0V)
3	V_0	Adj. Power Supply	Supply Voltage for contrast (approx. 0.5V)
4	RST	MPU	Active LOW Reset signal
5	E1	MPU	Operation Enable signal. Falling edge triggered, SEG (1~60)
6	E2	MPU	Operation Enable signal. Falling edge triggered, SEG (61~120)
7	R/W	MPU	Read/Write select signal, R/W=1: Read R/W: =0: Write
8	A0	MPU	Register Select signal. A0=0: Command, A0=1: Data
9-16	DB0-DB7	MPU	This is an 8-bit bi-directional data bus
17	LED+	Power Supply	Backlight Anode (15 mA @ 5V)
18	LED-	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 2.54mm pitch pins
Backlight connector: - **Mates with**: -



Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T_{OP}	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T_{ST}	Absolute Max	-30	-	+80	°C
Supply Voltage	V_{DD}	-	4.8	5.0	5.2	V
Supply Current	I_{DD}	V_{DD} = 5.0V T_{OP} = 25°C	0.5	1.0	3.0	mA
Supply for LCD (contrast)	V_{LCD}		4.3	4.5	4.7	V
"H" Level input	V_{IH}	-	3.5	-	V_{DD}	V
"L" Level input	V_{IL}	-	V_{SS}	-	1.1	V
"H" Level output	V_{OH}	-	V_{DD} - 0.3	-	V_{DD}	V
"L" Level output	V_{OL}	-	V_{SS}	-	0.3	V
Backlight Supply Current	I_{LED}	-	-	15	20	mA
Backlight Supply Voltage	V_{LED}	I_{LED} = 15 mA	4.8	5.0	5.2	V

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 2	-	40	-	º
	Bottom	φY-		-	60	-	º
	Left	θX-		-	60	-	º
	Right	θX+		-	60	-	º
Contrast Ratio		CR	-	2	5	-	-
Response Time	Rise	T_R	T_{OP} = 25°C	-	150	250	ms
	Fall	T_F		-	200	300	ms

Controller Information

Built-in SBN1661G_M18 Controller.
Please download specification at http://www.newhavendisplay.com/app_notes/SBN1661G.pdf

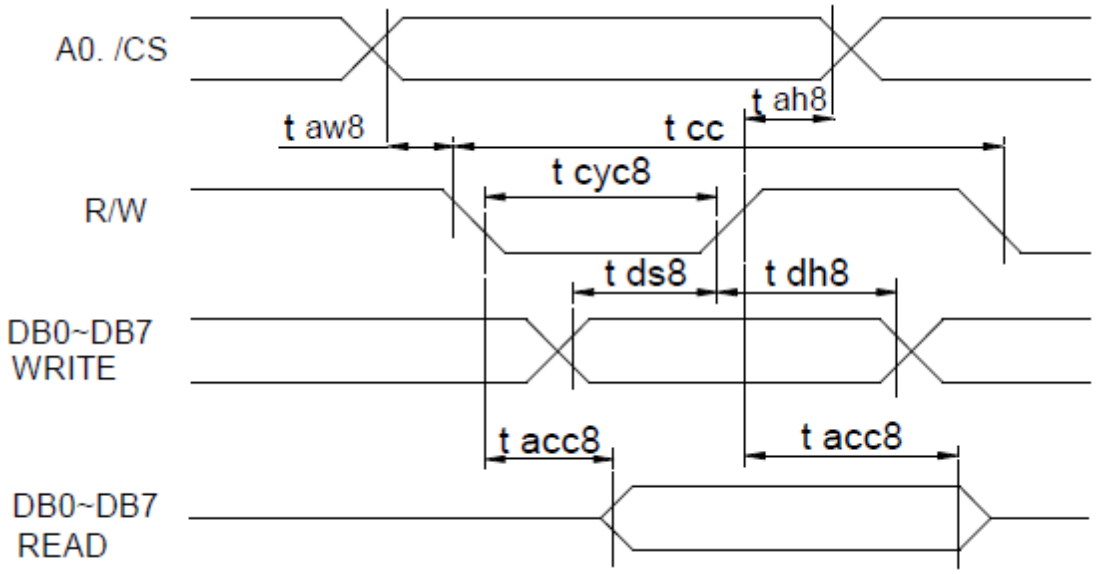
Table of Commands

Parameter	A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0	Note
Display ON /OFF	0	1	0	1	0	1	0	1	1	1	0/1	Turns display on or off 1: ON ; 0 : OFF
Display start line	0	1	0	1	1	0	Display start address (0 to 31)					Specifies RAM line corresponding to top line of display
Set page address	0	1	0	1	0	1	1	1	0	Page (0 to 3)		Sets display RAM page in page address register
Set column (segment) address	0	1	0	0	Column address (0 to 79)							Sets display RAM column address in column address register
Read status	0	0	1	Bu sy	A D C	ON/ OFF	R E S E T	0	0	0	0	Reads the following status: BUSY 1: Busy 0: Ready ADC 1: CW output 0: CCW output ON/OFF 1: Display off 0: Display on RESET 1: Being reset 0: Normal
Write display data	1	1	0	Write data								Write data from data bus into display RAM
Read display data	1	0	1	Read data								Read data from display RAM onto data bus
Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	0: CW output 1: CCW output
Static driver ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Selects static driving operation. 1: static driver, 0: Normal driving
Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Select LCD duty cycle 1: 1/32, 0: 1/16
Read-modify write	0	1	0	1	1	1	0	0	0	0	0	Read-modify-write ON
End	0	1	0	1	1	1	0	1	1	1	0	Read-modify-write OFF
Reset	0	1	0	1	1	1	0	0	0	1	0	Software reset

Timing Characteristics

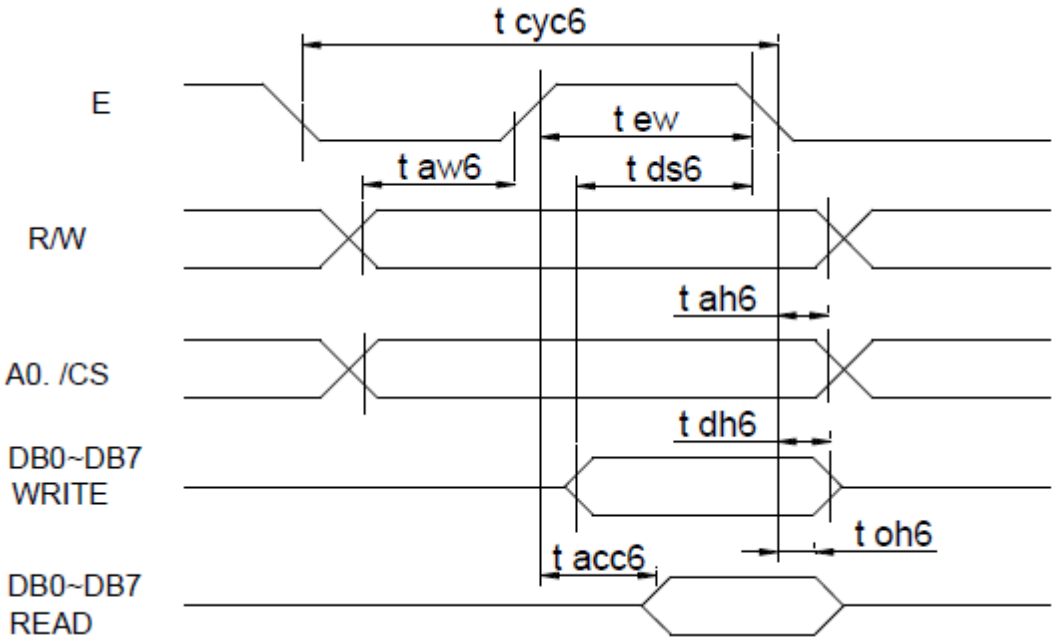
MPU bus Read/Write (8080 Interface)

Item	symbol	Conditions	Min.	Max.	unit
System cycle time	t cyc8	—	1000	—	ns
Address setup time	t aw8	—	20	—	ns
Address hold time	t ah8	—	10	—	ns
Data setup time	t ds8	—	80	—	ns
Data hold time	t dh8	—	10	—	ns
Control pulse width	t cc	—	200	—	ns
RD access time	t cc8	CL=100pf	—	90	ns
Output disable time	t ch8		10	60	ns



MPU bus Read/Write (6800 Interface)

Item	symbol	Conditions	Min.	Max.	unit
System cycle time	t cyc8	—	1000	—	ns
Address setup time	t aw8	—	20	—	ns
Address hold time	t ah8	—	10	—	ns
Data setup time	t ds8	—	80	—	ns
Data hold time	t dh8	—	10	—	ns
Control pulse width	t cc	—	200	—	ns
RD access time	t cc8	CL=100pf	—	90	ns
Output disable time	t ch8		10	60	ns



Example Initialization Program

```
/****************************************/
void Comleft(char i)
{
 P1 = i;
 R_W = 0;
 D_I = 0;
 E1 = 1;
 delay(2);
 E1 = 0;
}

void Comright(char i)
{
 P1 = i;
 R_W = 0;
 D_I = 0;
 E2 = 1;
 delay(2);
 E2 = 0;
}

void Writeleft(char i)
{
 P1 = i;
 R_W = 0;
 D_I = 1;
 E1 = 1;
 delay(2);
 E1 = 0;
}

void Writeright(char i)
{
 P1 = i;
 R_W = 0;
 D_I = 1;
 E2 = 1;
 delay(2);
 E2= 0;
}
/****************************************/
void bothSides(char i)
{
 Comleft(i);
 Comright(i);
}
/****************************************/

void init()
{
 P1 = 0;
 P3 = 0;
 RST = 0;                    //Reset RST
 delay(1);
 RST = 1;                    //Reset RST= M68 Interface
 delay(10);
 D_I = 0;
R_W = 1;

 bothSides(0xE2);        //0xE2 – Software reset
 delay(10);
 bothSides(0xA4);        //0xA4 – Static Driver off
 bothSides(0xA9);        //0xA9 – select 1/32 duty
 bothSides(0xA0);        //0xA0 – Memory/Segment mapping normal
 bothSides(0xEE);        //0xEE – End
 bothSides(0xC0);        //0xC0 – start at line address 0x00
 bothSides(0xAF);        //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.	+80°C , 48 hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 48 hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C 48 hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 48 hrs	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.	+60°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.	-20°C,30min -> 25°C,5min -> 70°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