NHD-0420DZ-FL-YBW

Character Liquid Crystal Display Module

NHD-	Newhaven Display
0420-	4 lines x 20 characters
DZ-	Model
F-	Transflective
L-	Yellow/Green LED Backlight
Y-	STN- Yellow/Green
B-	6:00 view
W-	Wide Temp. (-20°C~+70°C)
	RoHS Compliant

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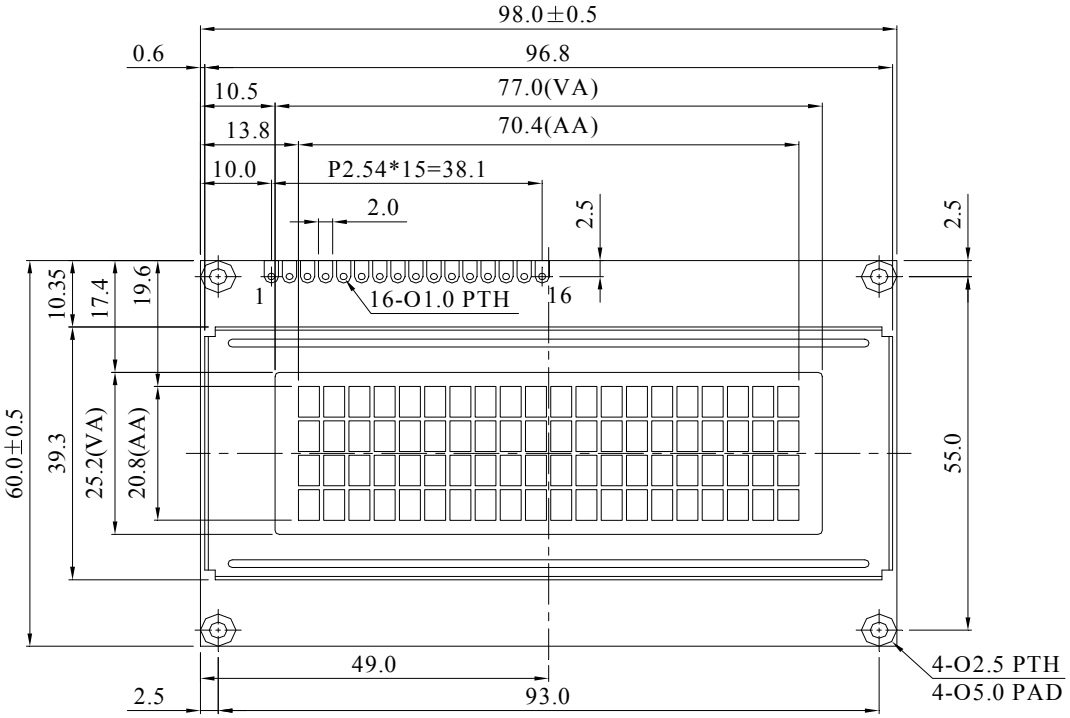
Document Revision History

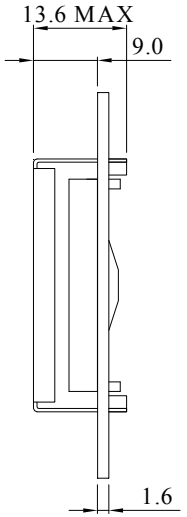
Revision	Date	Description	Changed by
0	**10/21/2008**	**Initial Release**	**-**
1	**1/22/2010**	**User Guide Reformat**	**MC**
2	**2/25/2010**	**Updated Mechanical Drawing**	**MC**
3	**3/19/2010**	**Updated Mechanical Drawing**	**BE**
4	**1/6/2011**	**Updated Controller Information**	**JT**
5	**5/6/2011**	**Electrical characteristics updated**	**AK**
6	**12/5/2011**	**Mechanical drawing updated**	**AK**
7	**6/8/2012**	**Electrical characteristics updated**	**TJ**

Functions and Features

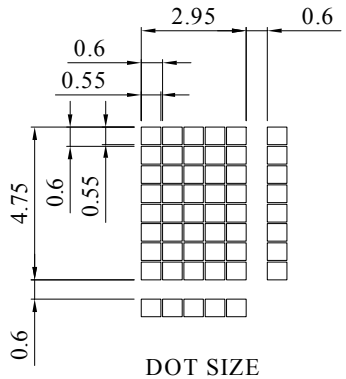
- **4 lines x 20 characters**
- **Built-in controllers (ST7066U)**
- **+5.0V Power Supply**
- **1/16 duty, 1/5 bias**
- **RoHS compliant**

Mechanical Drawing





LED B/L



DOT SIZE
SCALE 5/1

PIN NO.	SYMBOL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/$\overline{W}$
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K

The non-specified tolerance of dimension is ±0.3mm.

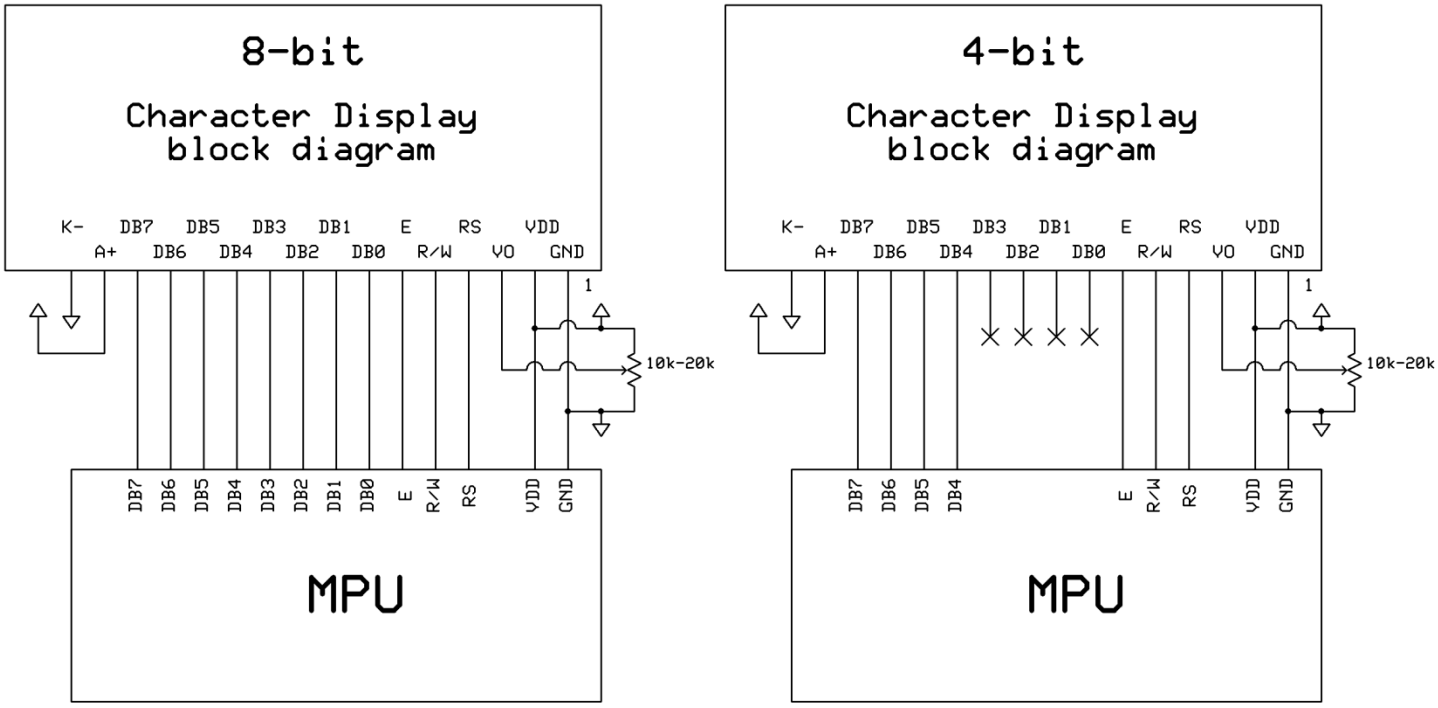
NEWHAVEN DISPLAY

NHD-0420DZ-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	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		4.5	5.0	5.5	V
Supply Current	IDD	Ta=25°C, VDD=5.0V	-	3.5	5.0	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	-	4.5	-	V
"H" Level input	Vih		0.7 VDD	-	VDD	V
"L" Level input	Vil		0	-	0.6	V
"H" Level output	Voh		3.9	-	-	V
"L" Level output	Vol		-	-	0.4	V
Backlight Supply Voltage	Vled	-	-	5.0	-	V
Backlight Supply Current	Iled	Vled=5.0V	-	280	-	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 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	17	18	19	20
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53
14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	24	25	26	26	27
54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67

Command Table

Instruction	Instruction Code										Description	Description Time (270KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.52 ms
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	37 us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	37 us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 us
Function Set	0	0	0	0	1	DL	N	F	x	x	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	37 us
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	37 us

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

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