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NHD-10032AZ-FSPG-YBW

Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
10032-	100 x 32 pixels
AZ-	Model
F-	Transflective
SPG-	Side Pure 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	6/7/2007	Initial Release	-
1	2/22/2010	User guide reformat	BE
2	3/17/2010	Pin description updated	BE
3	6/25/2010	Mechanical drawing update	MP
4	7/27/2011	Pin description updated	AK

Functions and Features

- 100 x 32 pixels
- Built-in SED-1520 Controller
- +5.0V power supply
- 1/32 duty cycle; 1/7 bias
- RoHS Compliant

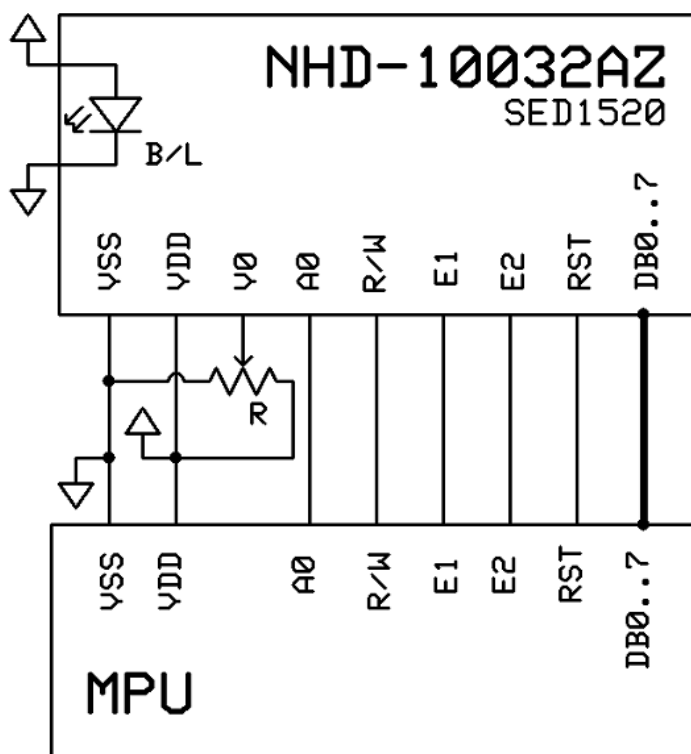


Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VSS	Power Supply	Ground
2	VDD	Power Supply	Power supply for logic (+5.0V)
3	V0	Adj Power Supply	Power supply for contrast (approx. -0.5V)
4	A0	MPU	Register select signal. A0=0: Command, A0=1: Data
5	R/W	MPU	Read/Write select signal, R/W=1: Read R/W: =0: Write
6	E1	MPU	Operation enable signal. Falling edge triggered, SEG (1~60)
7	E2	MPU	Operation enable signal. Falling edge triggered, SEG (61~120)
8	RST	MPU	Active low Reset
9-12	DB0-DB3	MPU	Four low order bi-directional three-state data bus lines. These four are not used during 4-bit operation.
13-16	DB4-DB7	MPU	Four high order bi-directional three-state data bus lines.
17	LED+	Power Supply	Power supply for LED Backlight (+5.0V via on-board resistor)
18	LED-	Power Supply	Ground for Backlight

Recommended LCD connector: 18pos, 1.0mm pitch FFC Connector, Molex p/n: 52271-1879 or equivalent

Backlight connector: on LCD 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		-	5.0	-	V
Supply Current	IDD	Ta=25°C, VDD=5.0V	-	2.0	2.5	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	-	5.5	-	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	-	30	-	mA

Optical Characteristics

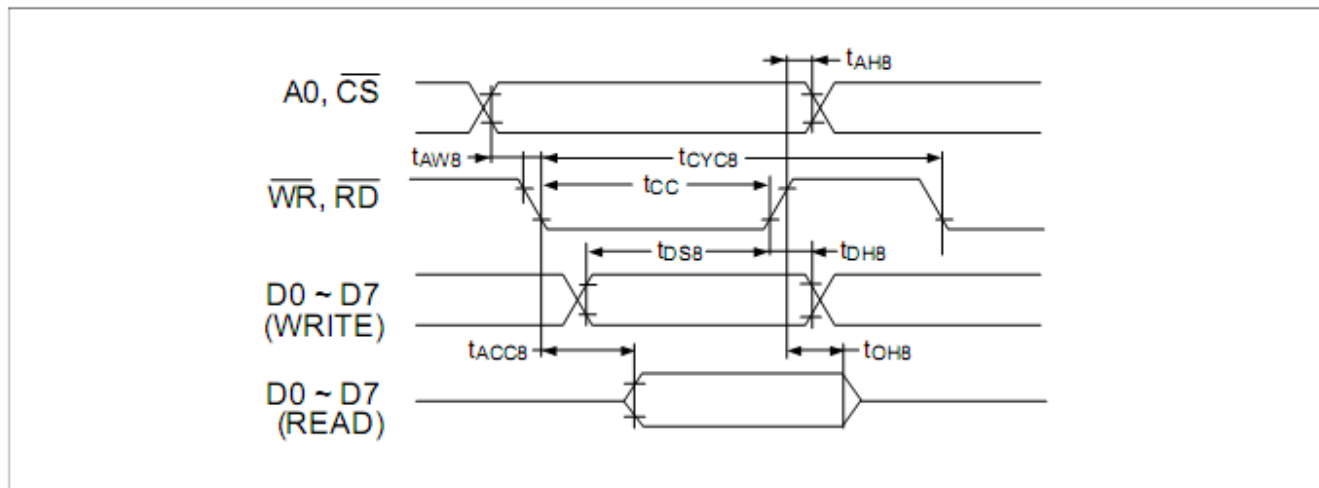
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical (top)	AV	Cr ≥ 3	-	10	-	
Viewing Angle – Vertical (bottom)	AV	Cr ≥ 3	-	60	-	°
Viewing Angle – Horizontal (left)	AH	Cr ≥ 3	-	45	-	
Viewing Angle - Horizontal (right)	AH	Cr ≥ 3	-	45	-	°
Contrast Ratio	Cr		-	5	-	-
Response Time (rise)	Tr	-	-	100	150	ms
Response Time (fall)	Tf	-	-	150	200	ms

Controller Information

Built-in SED-1520. Download specification at http://www.newhavendisplay.com/app_notes/SED1520.pdf

Timing Characteristics

5.3.1 System Bus Read/Write I (80 Family MPU)



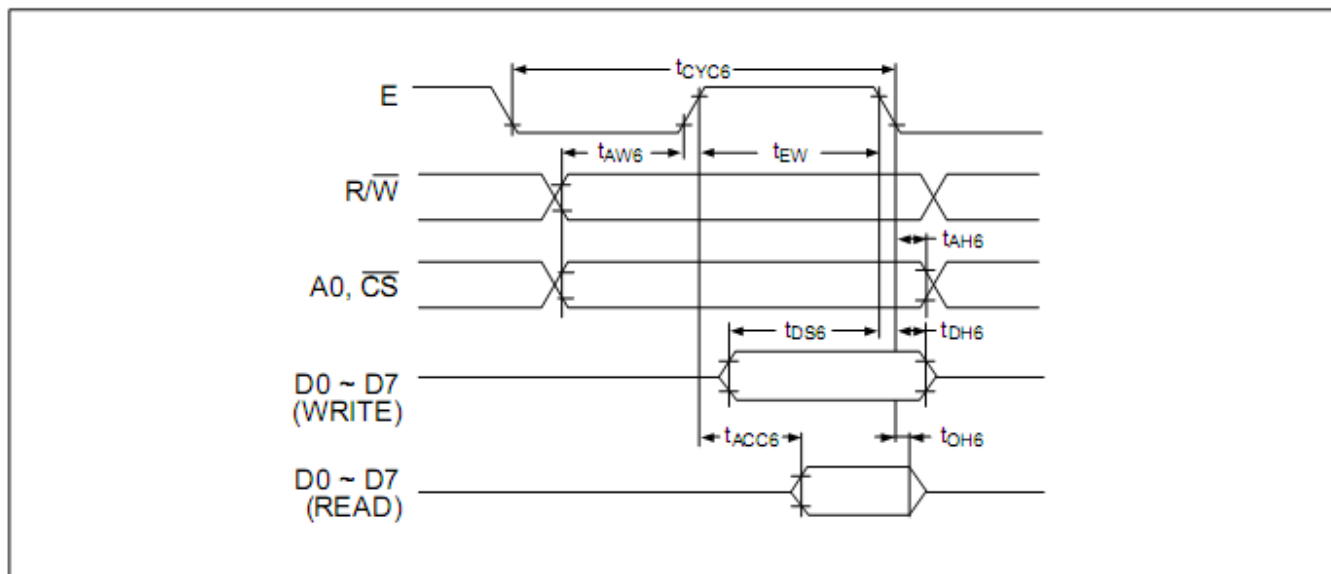
$T_a = -20$ to 75°C , $V_{SS} = -5.0\text{V} \pm 10\%$, Unit: ns

Signal	Symbol	Parameter	Min.	Max.	Condition
A0, $\overline{\text{CS}}$	t_{AH8}	Address hold time	10		
	t_{AW8}	Address setup time	20		
$\overline{\text{WR}}, \overline{\text{RD}}$	t_{CYC8}	System cycle time	1000		
	t_{CC}	Control pulse width	200		
D0~D7	t_{DS8}	Data setup time	80		CL = 100pF
	t_{DH8}	Data hold time	10		
	t_{ACC8}	$\overline{\text{RD}}$ access time		90	
	t_{OH8}	Output disable time	10	60	

*1. Each of the values where $V_{SS} = -3.0\text{V}$ is about 200% of that where $V_{SS} = -5.0\text{V}$ (i.e., the listed value).

*2. The rise or fall time of input signals should be less than 15 ns.

5.3.2 System Bus Read/Write II (68 Family MPU)



$T_a = -20$ to 75°C , $V_{ss} = -5.0\text{V} \pm 10\%$, Unit: ns

Signal	Symbol	Parameter	Min.	Max.	Condition
A0, $\overline{CS}$ R/W	t_{Cyc6}^{*1}	System cycle time	1000		
	t_{AW6}	Address setup time	20		
	t_{AH6}	Address hold time	10		
D0-D7	t_{DS6}	Data setup time	80		
	t_{DH6}	Data hold time	10		CL = 100pF
	t_{OH6}	Output disable time	10	60	
	t_{ACC6}	Access time		90	
E	t_{EW}	Enable pulse width	Read	100	
			Write	80	

*1. t_{Cyc6} indicates the cycle time during which $\overline{CS} \cdot E = "H"$. It does not mean the cycle time of signal E.

*2. Each of the values where $V_{ss} = -3.0\text{V}$ is about 200% of that where $V_{ss} = -5.0\text{V}$ (i.e., the listed value).

*3. The rise or fall time of input signals should be less than 15 ns.

Table of Commands

	Command	Code											Function
		A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	
(1)	Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0/1	Turns all display on or off, independently of display RAM data or internal status. 1: ON 0: OFF (Power-saving mode with static drive on)*
(2)	Display start line	0	1	0	1	1	0	Display Start Address (0–31)					Specifies RAM line corresponding to uppermost line (COM0) of display.
(3)	Set page address	0	1	0	1	0	1	1	1	0	Page (0–3)		Sets display RAM page in page address register.
(4)	Set column (segment) address	0	1	0	0	Column Address (0–79)							Sets display RAM column address in column address register.
(5)	Read status	0	0	1	Busy	ADC	ON/OFF	RESET	0	0	0	0	Reads the following status: BUSY 1: Internal operation, 0: Ready ADC 1: CW output (forward), 0: CCW output (reverse) ON/OFF 1: Display off, 0: Display on RESET 1: Being reset, 0: Normal
(6)	Write display data	1	1	0	Write Data								Writes data from data bus into display RAM.
(7)	Read display data	1	0	1	Read Data								Reads data from display RAM onto data bus.
(8)	Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	Used to invert relationship of assignment between display RAM column addresses and segment driver outputs. 0: CW output (forward) 1: CCW output (reverse)
(9)	Static drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Selects normal display or static driving operation. 1: Static drive (power-saving mode) 0: Normal driving
(10)	Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Selects LCD cell driving duty. 1: 1/32 0: 1/16
(11)	Read modify write	0	1	0	1	1	1	0	0	0	0	0	Increments column address counter by 1 when display data is written. (This is not done when data is read.)
(12)	End	0	1	0	1	1	1	0	1	1	1	0	Clears read modify write mode.
(13)	Reset	0	1	0	1	1	1	0	0	0	1	0	Sets display start line register on the first line. Also sets column address counter and page address counter to 0.

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 Writerright(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;  
    E1 = 1;  
    E2 = 1;  
    R_W = 1;
```

```
bothSides(0xE2);
delay(10);
bothSides(0xA4);
bothSides(0xA9);
bothSides(0xA0);
bothSides(0xEE);
bothSides(0xC0);
bothSides(0xAF);
}
/*****/
```

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 , 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C 200hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 200hrs	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 , 96hrs	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