

# NHD-12864AZ-FSW-GBW-VZ

## Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12864-	128 x 64 Pixels
AZ-	Model
F-	Transflective
SW-	Side White LED backlight
G-	STN- Gray
B-	6:00 Optimal View
W-	Wide Temperature
VZ-	With Built-in Negative Voltage Supply
	<b>RoHS Compliant-8.8</b>

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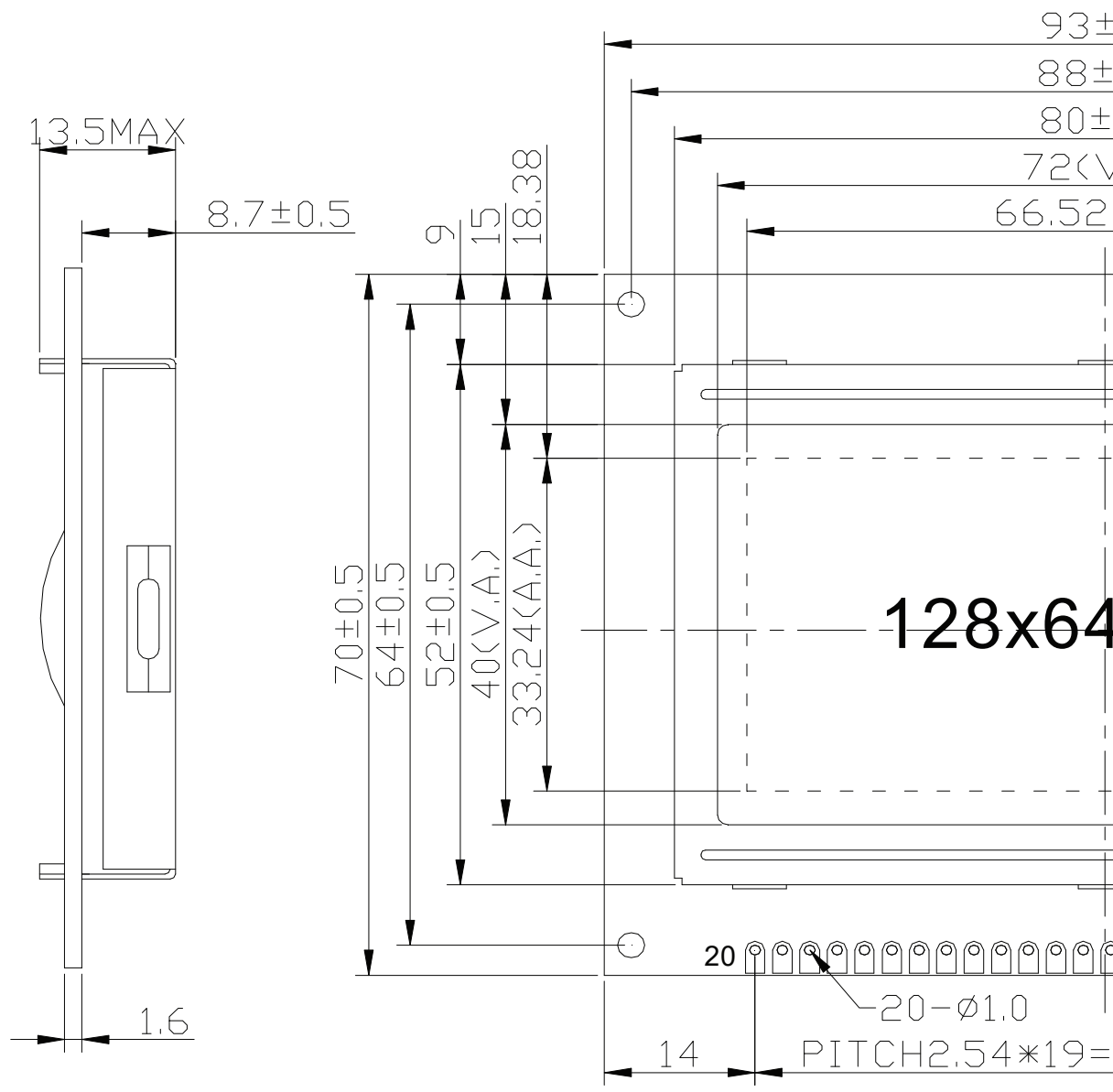
## Document Revision History

Revision	Date	Description	Changed by
0	11/15/08	Initial Release	-
1	4/2/10	User guide reformat	BE
2	5/6/10	Block diagram/initialization updated	BE
3	1/21/11	Update Electrical Characteristics	JT
4	12/17/12	Controller information updated	AK
5	8/24/17	Mechanical Drawing, Electrical & Optical Char. Updated	SB
6	3/7/19	Mechanical Drawing & Electrical Characteristics Updated	SB

## Functions and Features

- 128x64 pixels
- Built-in AiP31108 (or equivalent) controller
- +5.0V power supply
- 1/64 duty, 1/9 bias
- RoHS Compliant

A  
B  
C  
D  
E  
F



**Notes:**

- |                  |                                     |
|------------------|-------------------------------------|
| 1. Driver:       | 1/64 Duty, 1/9                      |
| 2. Display Mode: | STN Positive / Gray / Transflective |
| 3. Optimal View: | 6:00                                |
| 4. Voltage:      | 5.0V VDD, 8.7V VLCD                 |
| 5. Backlight:    | White LED                           |
| 6. Driver IC:    | AiP31108                            |

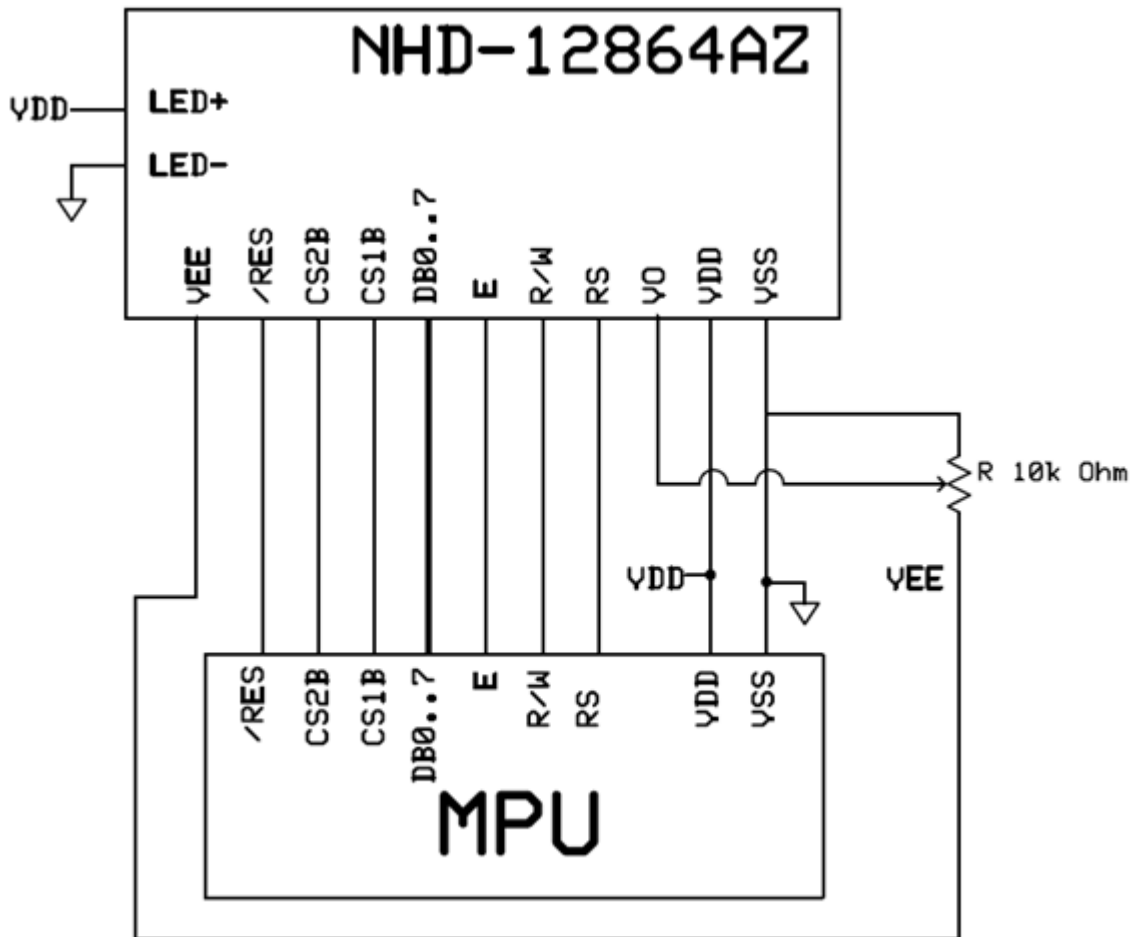
1 2 3 4

## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V <sub>SS</sub>	Power Supply	Ground
2	V <sub>DD</sub>	Power Supply	Supply Voltage for Logic (+5.0V)
3	V <sub>0</sub>	Adj. Power Supply	Supply Voltage for Contrast (approx. -3.7V)
4	RS	MPU	Register Select: 1=Data, 0=Instruction
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.
7-14	DB0-DB7	MPU	This is an 8-bit Bi-directional data bus
15	CS1B	MPU	Chip Selection: CS1=H, CS2=L → select IC1 (left side) CS1=L, CS2=H → select IC2 (right side)
16	CS2B	MPU	
17	/RES	MPU	Active LOW Reset signal
18	VEE	Power Supply	Negative voltage output (-10V)
19	LED+	Power Supply	Backlight Anode (+5V Via On Board Resistor)
20	LED-	Power Supply	Backlight Cathode

Recommended LCD connector: 2.54mm pitch pins

Backlight connector: ----



## Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T <sub>OP</sub>	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T <sub>ST</sub>	Absolute Max	-30	-	+80	°C
Supply Voltage	V <sub>DD</sub>	-	4.8	5.0	5.2	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> = 5.0V	1.5	3.0	4.0	mA
Supply for LCD (contrast)	V <sub>LCD</sub>	T <sub>OP</sub> = 25°C	8.3	8.7	9.2	V
"H" Level input	V <sub>IH</sub>	-	0.7 * V <sub>DD</sub>	-	V <sub>DD</sub>	V
"L" Level input	V <sub>IL</sub>	-	V <sub>SS</sub>	-	0.3 * V <sub>DD</sub>	V
"H" Level output	V <sub>OH</sub>	-	2.4	-	V <sub>DD</sub>	V
"L" Level output	V <sub>OL</sub>	-	V <sub>SS</sub>	-	0.4	V
Backlight Supply Voltage	V <sub>LED</sub>	-	4.8	5.0	5.2	V
Backlight Supply Current	I <sub>LED</sub>	V <sub>LED</sub> = 5.0V	20	30	40	mA

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	CR ≥ 2	-	40	-	°
	Bottom		-	60	-	°
	Left		-	60	-	°
	Right		-	60	-	°
Contrast Ratio	CR	-	2	5	-	-
Response Time	Rise	T <sub>OP</sub> = 25°C	-	150	250	ms
	Fall		-	200	300	ms

## Controller Information

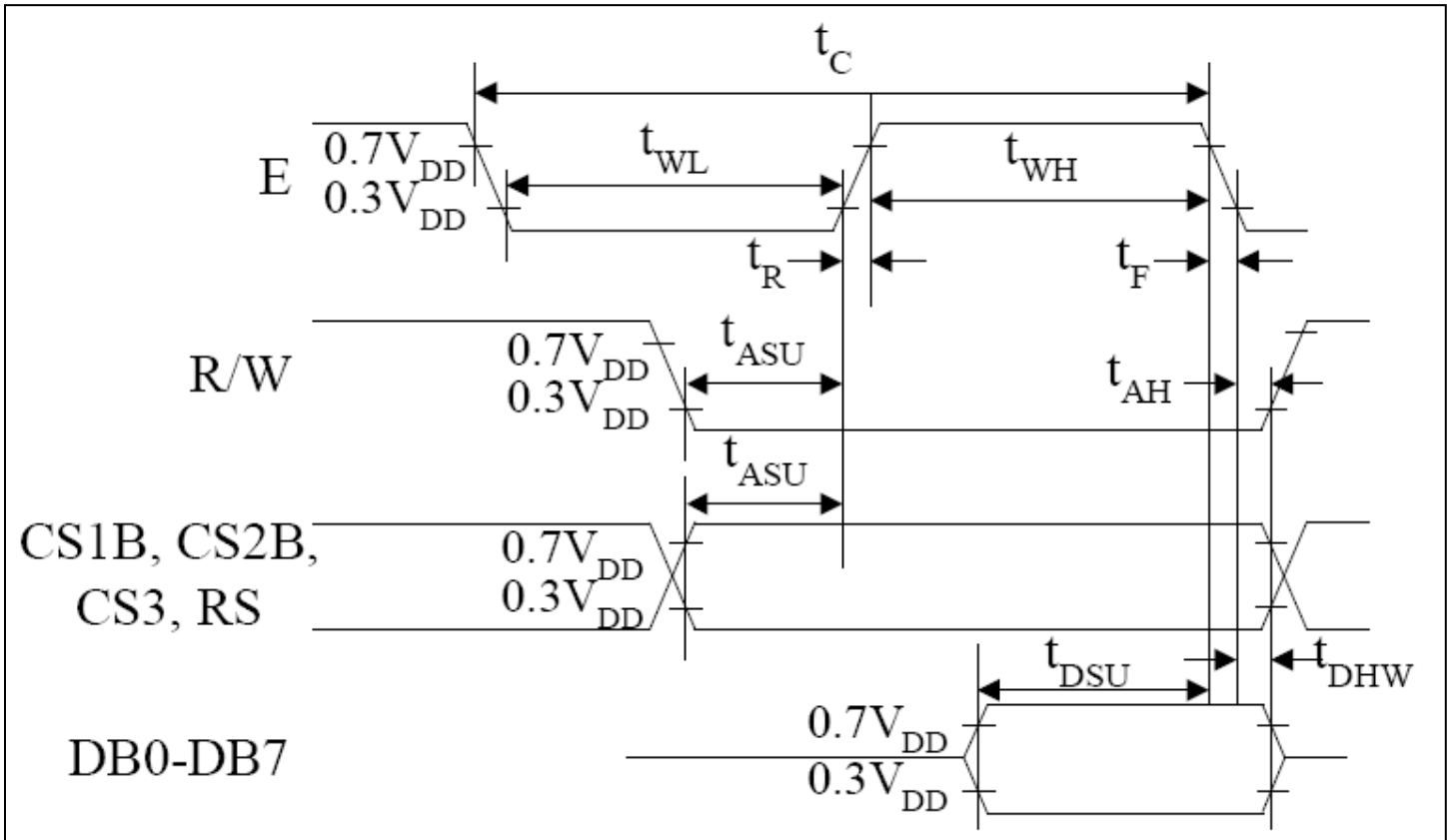
Built-in AiP31108 controller.

Please download specification at <https://www.newhavendisplay.com/appnotes/datasheets/LCDs/AiP31108.pdf>

## Table of Commands

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L:OFF, H:ON	
Set address (Y address)	L	L	L	H	Y address (0-63)						Sets the Y address in the Y address counter.	
Set page (X address)	L	L	H	L	H	H	H	Page (0-7)			Sets the X address at the X address register.	
Display Start line (Z address)	L	L	H	H	Display start line (0-63)						Indicates the display data RAM displayed at the top of the screen.	
Status read	L	H	Busy	L	On/Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset	
Write display data	H	L	Write data									Writes data (DB0: 7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data									Reads data (DB0: 7) from display data RAM to the data bus.

## Timing Characteristics



Characteristic	Symbol	Min	Type	Max	Unit
E cycle	$t_c$	1000	-	-	ns
E high level width	$t_{WH}$	450	-	-	
E low level width	$t_{WL}$	450	-	-	
E rise time	$t_R$	-	-	25	
E fall time	$t_F$	-	-	25	
Address set-up time	$t_{ASU}$	140	-	-	
Address hold time	$t_{AH}$	10	-	-	
Data set-up time	$t_{DSU}$	200	-	-	
Data delay time	$t_D$	-	-	320	
Data hold time (write)	$t_{DHW}$	10	-	-	
Data hold time (read)	$t_{DHR}$	20	-	-	

## Example Initialization Program

```
'-----  
'DB0-DB7  7-14          P1  
'CS2      16           P3.6  
'CS1      15           P3.1  
'RST      17           P3.2  
'R/W      5            P3.7  
'D/I      4            P3.0  
'E        6            P3.4  
'-----  
Sub Init  
  Reset P3.2  
  Set P3.2  
  Reset P3.4  
  Reset P3.0  
  Reset P3.7  
  Reset P3.6  
  Reset P3.1  
  A = &H3F  
  Call Comleft           'display on  
  Call Comright         'display on  
End Sub  
'-----  
Sub Comleft  
  P1 = A  
  Set P3.6  
  Reset P3.0  
  Set P3.4  
  Reset P3.4  
  Reset P3.6  
End Sub  
  
Sub Comright  
  P1 = A  
  Set P3.1  
  Reset P3.0  
  Set P3.4  
  Reset P3.4  
  Reset P3.1  
End Sub  
  
Sub Writeleft  
  P1 = A  
  Set P3.6  
  Set P3.0  
  Set P3.4  
  Reset P3.4  
  Reset P3.6  
End Sub  
  
Sub Writeright  
  P1 = A  
  Set P3.1  
  Set P3.0  
  Set P3.4  
  Reset P3.4  
  Reset P3.1  
End Sub
```



## 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](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisplay.com/index.php?main\\_page=terms](http://www.newhavendisplay.com/index.php?main_page=terms)

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