NEWHAVEN DISPLAY INTERNATIONAL

Product Specification

NHD-160128WG-BTGH-VZ#-1

Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
160128-	160 x 128 Pixels
WG-	Display Type: Graphic
B-	Model
T-	White LED Backlight
G-	STN (+), Gray
H-	Transflective, 6:00 Optimal View, Wide Temperature
VZ#-	Built-in Negative Voltage Supply
1-	Selectable Font Size (Default: 7 x 8 Font)

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REACH Compliant

RoHS Compliant

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Table of Contents

Additional Resources

- **Support Forum:** http://www.nhdforum.newhavendisplay.com
- **Github:** https://github.com/newhavendisplay
- **Example Code:** https://www.newhavendisplay.com/example_code.html
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **Quality Center:** https://www.newhavendisplay.com/quality_center.html
- **Precautions for using LCDs/LCMs:** https://www.newhavendisplay.com/specs/precautions.pdf
- **Warranty / Terms & Conditions:** https://www.newhavendisplay.com/terms.html

Document Revision History

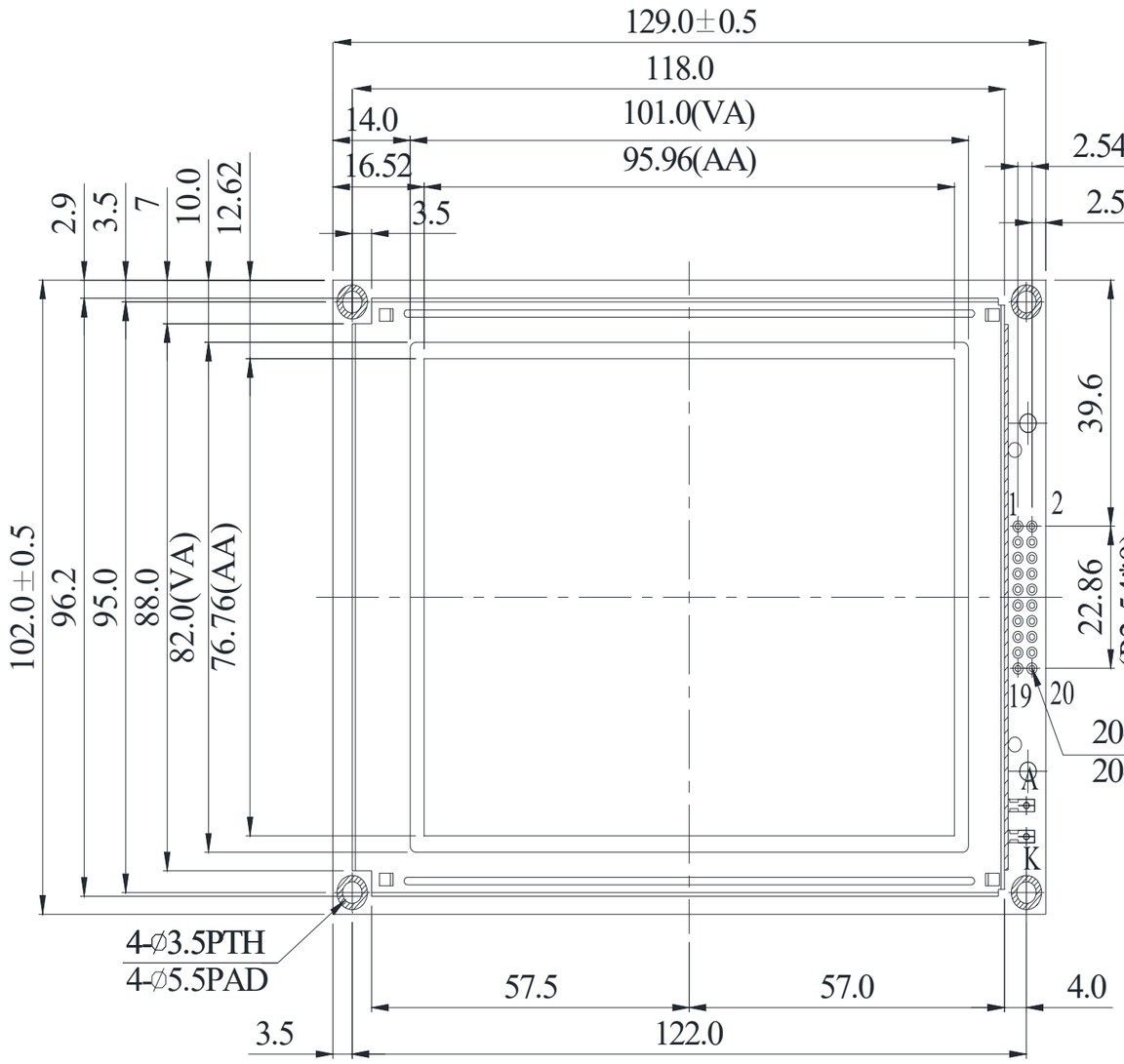
Revision	Date	Description	Changed By
0	3/16/10	Initial Release	-
1	4/13/10	User guide reformat	BE
2	4/21/10	Block diagram update	BE
3	5/14/10	Updated Input and Output Voltages in Electrical Characteristics	MC
4	5/15/17	Mechanical, Electrical & Optical Characteristics Updated	TM
5	12/29/17	Supply Current Updated	SB
6	9/20/19	Updated Drawing, Controller Link	AS
7	4/8/20	Glass Panel Updated	SB
8	6/24/20	Updated 2D Mechanical Drawing Page, Logic Voltage & Quality Information	AS
9	7/8/20	Fixed typo on 2D Mechanical Drawing	AS
10	5/12/21	Electrical, Optical & Controller IC Updated	ZP
11	8/18/21	Updated Mechanical Drawing	ZP

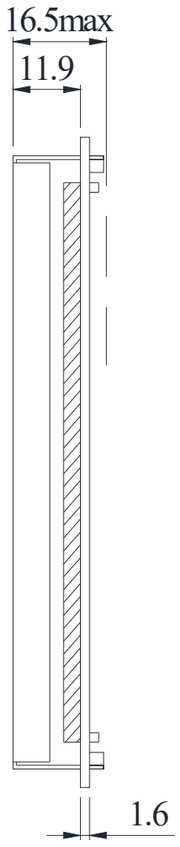
Functions and Features

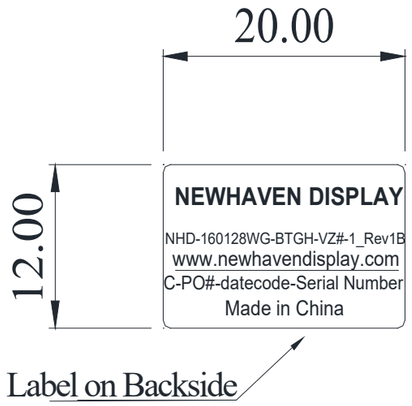
- 160 x 28 pixels
- Built-in RA6963N1 controller
- +5.0V Power Supply
- 1/128 duty

Mechanical Drawing

SYMBOL	REVISION	DATE





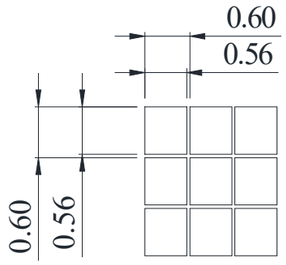


Pin Assignment

PIN NO.	SYMBOL
1	FG
2	Vss
3	VDD
4	Vo
5	Vee
6	$\overline{WR}$
7	$\overline{RD}$
8	$\overline{CE}$
9	D/$\overline{C}$
10	$\overline{HALT}$
11	$\overline{RESET}$
12	DB0
13	DB1
14	DB2
15	DB3
16	DB4
17	DB5
18	DB6
19	DB7
20	NC

Notes:

1. Driver: 1/128 Duty
2. Display Mode: STN Positive / Gray / Transflective
3. Optimal View: 6:00
4. Voltage: 5.0V V_{DD}, 19.2V V_{LCD}
5. Backlight: White LED
6. Driver IC: RA6963N1



Standard Tolerance:
(Unless otherwise specified)
Linear: ±0.3mm

NEWHAVEN DISPLAY INTERNATIONAL

Drawing/Part Number: NHD-160128WG-BTGH-VZ#-1			Revision: 1B
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection	Drawn By: Z.Palrang	Approved By: Z.Palrang	Size: A3
	Drawn Date: 08/18/2021	Approved Date: 08/18/2021	Scale: NS
	Do Not Scale Drawing		Sheet 1 of 1

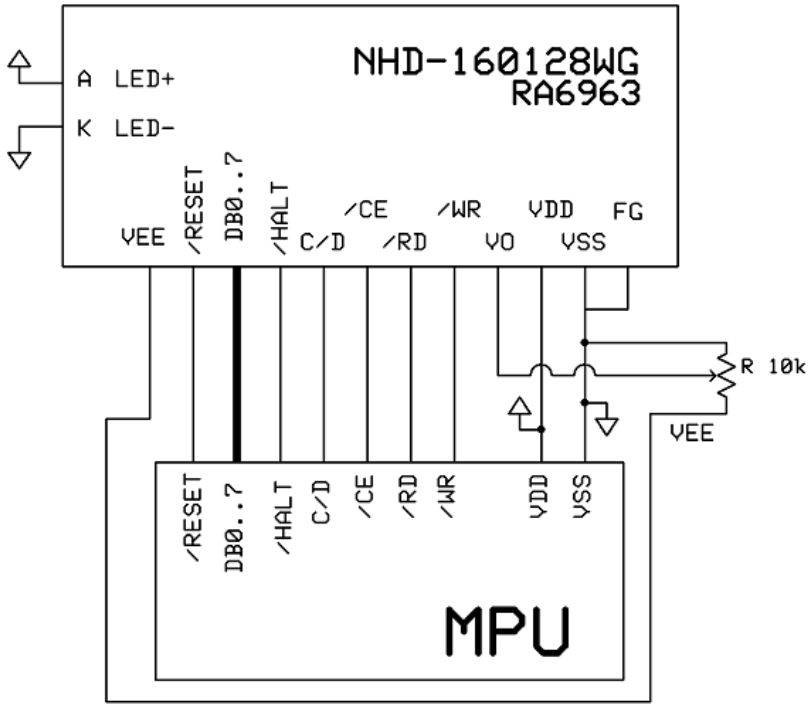
Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	FG	Power Supply	Frame Ground
2	V_{SS}	Power Supply	Ground
3	V_{DD}	Power Supply	Power supply for Logic (+5.0V)
4	V_0	Adj. Power Supply	Power supply for contrast (approx. -14.2V)
5	V_{EE}	Power Supply	Negative voltage output (-16.0V)
6	/WR	MPU	Active LOW Write signal
7	/RD	MPU	Active LOW Read signal
8	/CE	MPU	Active LOW Chip Select signal.
9	C/D	MPU	Register select signal. C/D=1: Command C/D=0: Data
10	/HALT	-	Active LOW Clock operating stop signal
11	/RESET	MPU	Active LOW Reset signal
12-19	DB0-DB7	MPU	This is an 8-bit Bi-directional data bus
20	NC	-	No Connect
A	LED+	Power Supply	Backlight Anode (128mA @ 3.5V)
K	LED-	Power Supply	Backlight Cathode (Ground)

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

Font Size Jumper Settings:

Font Size	JF0H	JF0L	JF1H	JF1L
5 x 8	**Short**	*Open*	**Short**	*Open*
6 x 8	*Open*	**Short**	**Short**	*Open*
7 x 8 **(Default)**	**Short**	*Open*	*Open*	**Short**
8 x 8	*Open*	**Short**	*Open*	**Short**



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}	-	4.5	5.0	5.5	V
Supply Current	I_{DD}	V_{DD} = 5.0V T_{OP} = 25°C	15	30	60	mA
Supply for LCD (contrast)	V_{LCD}		18.6	19.2	19.8	V
"H" Level input	V_{IH}	-	0.8*V_{DD}	-	V_{DD}	V
"L" Level input	V_{IL}	-	V_{SS}	-	0.15*V_{DD}	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 Voltage	V_{LED}	-	3.4	3.5	3.6	V
Backlight Supply Current	I_{LED}	V_{LED} = 3.5V	96	128	160	mA
Backlight Lifetime	-	I_{LED} = 128mA	-	50,000	-	Hrs.

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 2	0	-	20	º
	Bottom	φY-		0	-	40	º
	Left	θX-		0	-	30	º
	Right	θX+		0	-	30	º
Contrast Ratio		CR	-	2	3	-	-
Response Time	Rise	T_R	T_{OP} = 25°C	-	200	300	ms
	Fall	T_F		-	250	350	ms

Controller Information

Built-in RA6963N1 Controller.

Please download specification at https://www.newhavendisplay.com/resources_dataFiles/datasheets/LCDs/RA6963.pdf

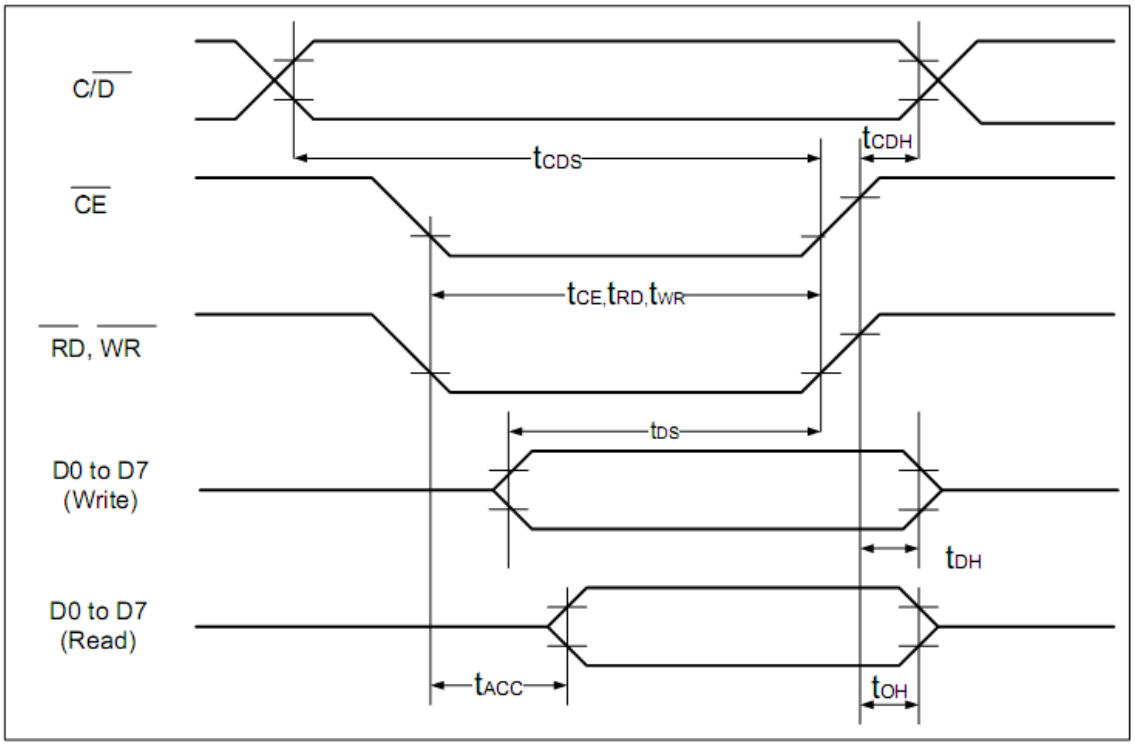
Table of Commands

Command	Code	D1	D2	Function
Registers Setting	00100001	X address	Y address	Set cursor pointer
	00100010	Data	00h	Set Offset Register
	00100100	Low address	High address	Set Address pointer
Set Control Word	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00h	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00h	Set Graphic Area
Mode Set	1000X000	--	--	OR mode
	1000X001	--	--	EXOR mode
	1000X011	--	--	AND mode
	1000X100	--	--	Text Attribute mode
	10000XXX	--	--	Internal CG ROM mode
	10001XXX	--	--	External CG RAM mode
Display Mode	10010000	--	--	Display off
	1001XX10	--	--	Cursor on, blink off
	1001XX11	--	--	Cursor on, blink on
	100101XX	--	--	Text on, graphic off
	100110XX	--	--	Text off, graphic on
	100111XX	--	--	Text on, graphic on
Cursor Pattern Select	10100000	--	--	1-line cursor
	10100001	--	--	2-line cursor
	10100010	--	--	3-line cursor
	10100011	--	--	4-line cursor
	10100100	--	--	5-line cursor
	10100101	--	--	6-line cursor
	10100110	--	--	7-line cursor
	10100111	--	--	8-line cursor
Data auto Read/Write	10110000	--	--	Set Data Auto Write
	10110001	--	--	Set Data Auto Read
	10110010	--	--	Auto Reset
Data Read/Write	11000000	Data	--	Data Write and Increment ADP
	11000001	--	--	Data Read and Increment ADP
	11000010	Data	--	Data Write and Decrement ADP
	11000011	--	--	Data Read and Decrement ADP
	11000100	Data	--	Data Write and Non-variable ADP
	11000101	--	--	Data Read and Non-variable ADP
Screen Peek	11100000	--	--	Screen Peek
Screen Copy	11101000			Screen Copy
Bit Set/Reset	11110XXX	--	--	Bit Reset
	11111XXX	--	--	Bit Set
	1111X000	--	--	Bit 0 (LSB)
	1111X001	--	--	Bit 1
	1111X010	--	--	Bit 2
	1111X011	--	--	Bit 3
	1111X100	--	--	Bit 4
	1111X101	--	--	Bit 5
	1111X110	--	--	Bit 6
	1111X111	--	--	Bit 7 (MSB)

Timing Characteristics

(V_{DD}=+5V±5%,GND=0V,Ta= -20 to +70℃)

Item	Symbol	Test Conditions	Min.	Max.	Unit
C/$\overline{D}$ Set Up Time	t_{CDS}	--	100	--	ns
C/$\overline{D}$ Hold Time	t_{CDH}	--	10	--	ns
$\overline{CE}$, $\overline{RD}$, $\overline{WR}$ Pulse Width	t_{CE}, t_{RD}, t_{WR}	--	80	--	ns
Data Set Up Time	t_{DS}	--	80	--	ns
Data Hold Time	t_{DH}	--	40	--	ns
Access Time	t_{ACC}	--	--	150	ns
Output Hold Time	t_{OH}	--	10	50	ns



Example Initialization Program

```
//-------------------------------------------------------------------------------
sbit ID = P3^1;
sbit CS = P3^1;
sbit RW = P3^0;
sbit CE  = P3^4;
//sbit READ = P0^0;
sbit FS = P3^2;
sbit RST = P3^6;

//-------------------------------------------------------------------------------
void Writecom(char i)
{
 P1 = i;
 ID = 1;
 CE = 0;
 RW = 0;
 //delay(1);
 RW = 1;
 CE = 1;
 //delay(1);
}

void Writedata(char i)
{
 P1 = i;
 ID = 0;
 CE = 0;
 RW = 0;
 //delay(1);
 RW = 1;
 CE = 1;
 //delay(1);
}
//-------------------------------------------------------------------------------
void Init()
{
 RST = 1;
 RD = 1;
 FS = 0;

 Writedata(0x00);
 Writedata(0x00);
 Writecom(0x40);
 Writedata(0x00);
 Writedata(0x40);
 Writecom(0x42);
 Writedata(0x1E);
 Writedata(0x00);
 Writecom(0x41);
 Writedata(0x1E);
 Writedata(0x00);
 Writecom(0x43);
 Writecom(0x80);
}
```

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 , 96 Hrs.	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 96 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 96 Hrs.	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 96 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 , 96 Hrs.	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 , 1.5mm amplitude. 60 sec in each of 3 directions X,Y,Z For 15 minutes	3
Static electricity test	Endurance test applying electric static discharge.	V_S=±800V, R_S=330Ω, C_S=150pF 10 Times	

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.