



**THE DATASHEET OF  
NHD-C12832A1Z-FSB-FBW-3V3**



**Product Specification**

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# NHD-C12832A1Z-FSB-FBW-3V3

## COG (Chip-On- Glass) Liquid Crystal Display Module

<b>NHD-</b>	Newhaven Display
<b>C12832-</b>	128 x 32 Pixels
<b>A1Z-</b>	Model
<b>F-</b>	Transflective
<b>SB-</b>	Side Blue LED Backlight
<b>F-</b>	FSTN (+)
<b>B-</b>	6:00 Optimal View
<b>W-</b>	Wide Temperature
<b>3V3-</b>	3Vdd, 3V Backlight

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## Additional Resources

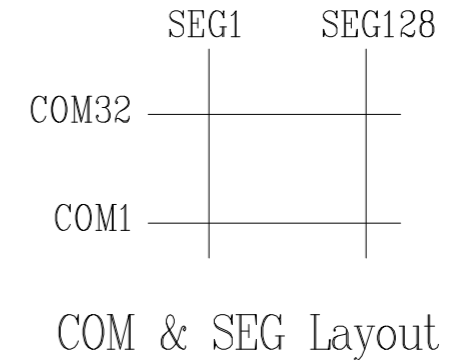
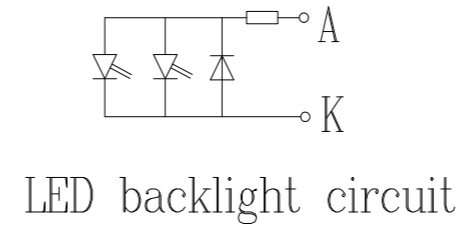
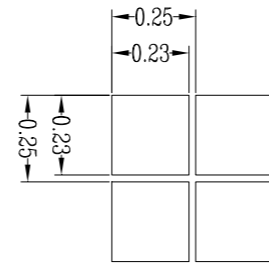
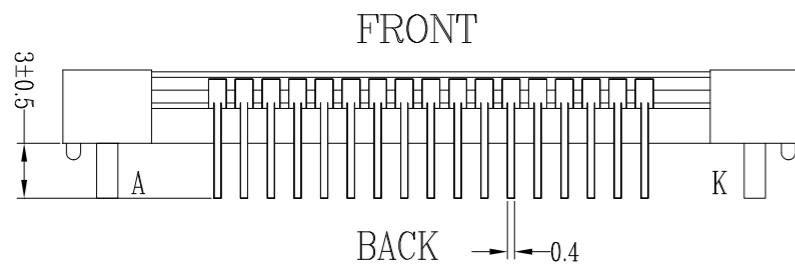
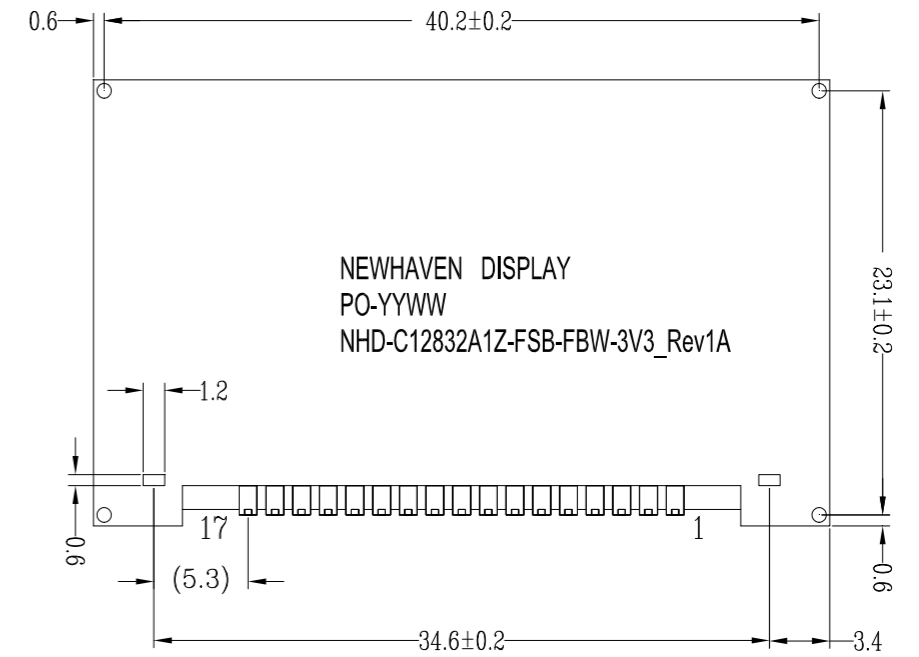
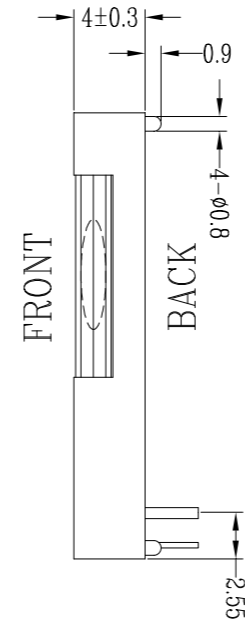
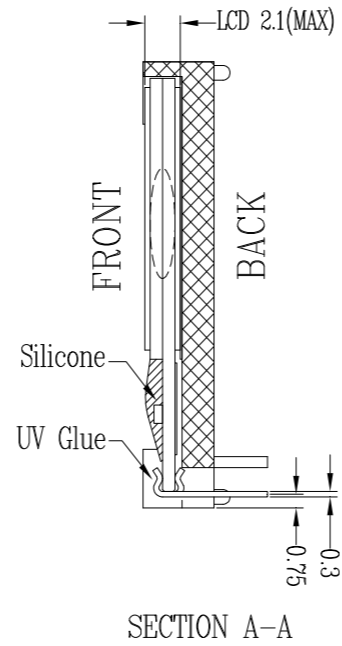
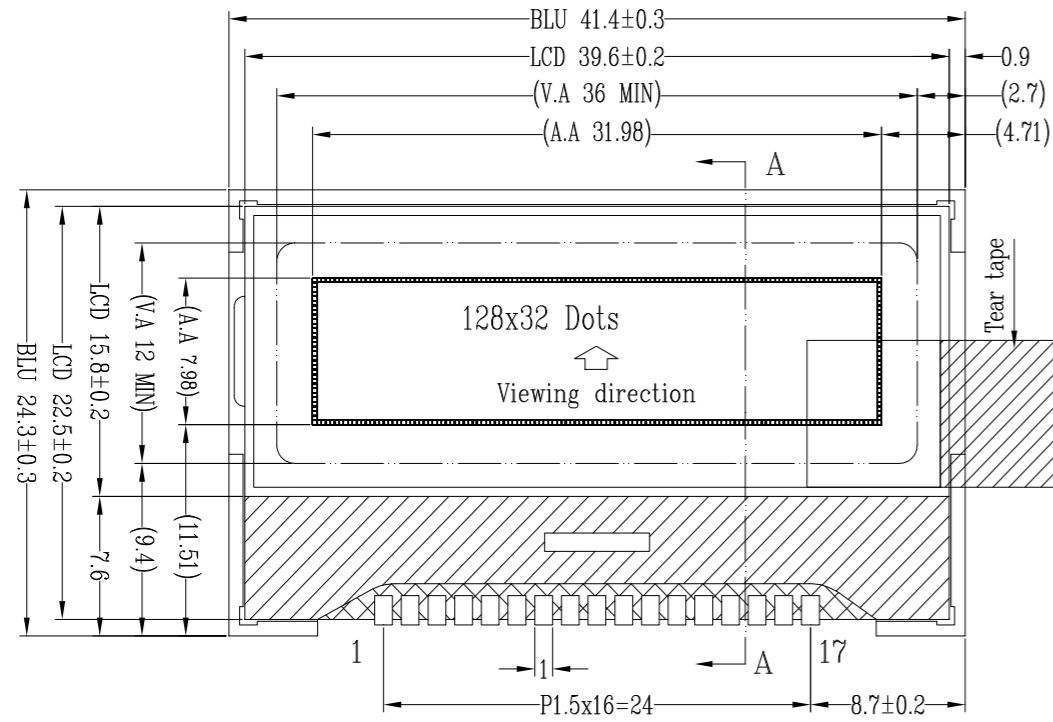
- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** [https://www.newhavendisplay.com/knowledge\\_center.html](https://www.newhavendisplay.com/knowledge_center.html)
- **Quality Center:** [https://www.newhavendisplay.com/quality\\_center.html](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	11/12/2008	Initial Release	-
1	09/27/2010	User Guide Reformat	BE
2	05/07/2013	Electrical and Optical characteristics updated. Pin Description, Wiring Diagram, Mechanical Drawing Page and Example Initialization Program Updated.	JN
3	01/25/2017	Mechanical Drawing, Electrical & Optical Char. Updated	SB
4	07/05/2019	Added PCB Footprint Drawing	AS
5	01/30/2019	Glass Panel Updated	SB
6	06/17/2020	Updated 2D Mechanical Drawing & Quality Information	AS
7	02/02/2024	Date Code Updated on Mechanical Drawing	KL
8	04/14/2024	PCB Footprint Drawing Updated	KL

# Mechanical Drawing



NO.	Symbol
1	V0
2	V1
3	V2
4	V3
5	V4
6	C2-
7	C2+
8	C1+
9	C1-
10	VOUT
11	VSS
12	VDD
13	SI
14	SCL
15	A0
16	/RES
17	CS1B

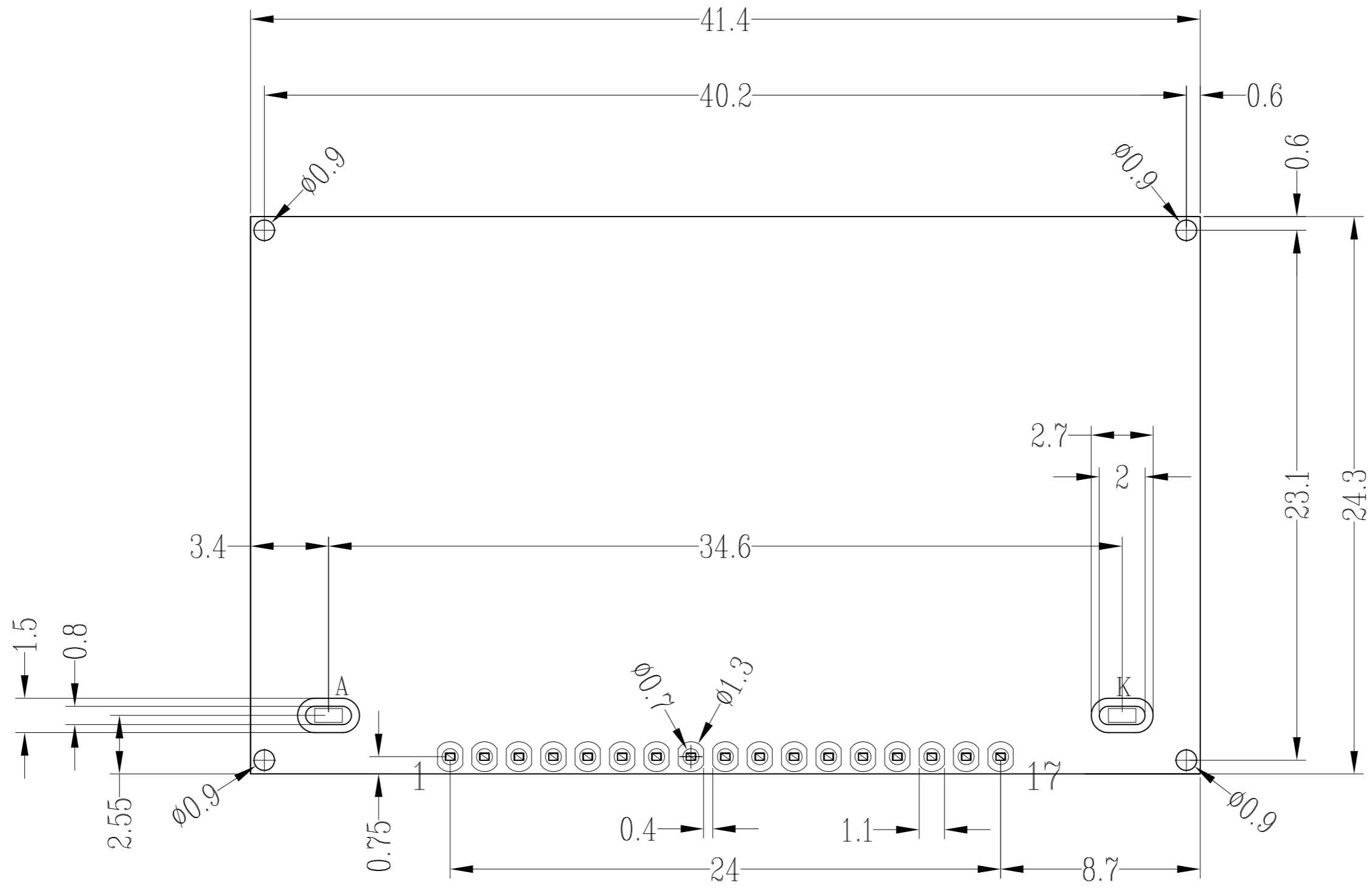
Product Description: 128x32 Graphic COG LCD

1. Driver IC: ST7565R
2. Driving Mode: 1/33 Duty, 1/6 Bias
3. Interface: 4-wire SPI
4. Power Requirement: 3.0V LCD
5. Optical Features: FSTN (+), Transflective, 6:00 View, Blue Backlight

<b>Standard Tolerance:</b> (Unless otherwise specified)  Linear: ±0.3mm		
	Drawing/Part Number: <b>NHD-C12832A1Z-FSB-FBW-3V3</b>	Revision: <b>1A</b>
<b>Unless otherwise specified:</b> • Dimensions are in Millimeters • Third Angle Projection	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 02/02/2024	Approved Date: 02/02/2024
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# Mechanical Drawing

## Recommended PCB Footprint



### Applicable Displays:

- 1) NHD-C12832A1Z-FSW-FBW-3V3
- 2) NHD-C12832A1Z-NSW-BBW-3V3
- 3) NHD-C12832A1Z-FSR-FBW-3V3
- 4) NHD-C12832A1Z-FSB-FBW-3V3

<b>Standard Tolerance:</b> (Unless otherwise specified)  Linear: $\pm 0.3$ mm		
	Drawing/Part Number: NHD-C12832A1Z-Monochrome-Footprint	Revision: -
<b>Unless otherwise specified:</b> • Dimensions are in Millimeters • Third Angle Projection 	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 04/09/2024	Approved Date: 04/09/2024
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## Pin Description

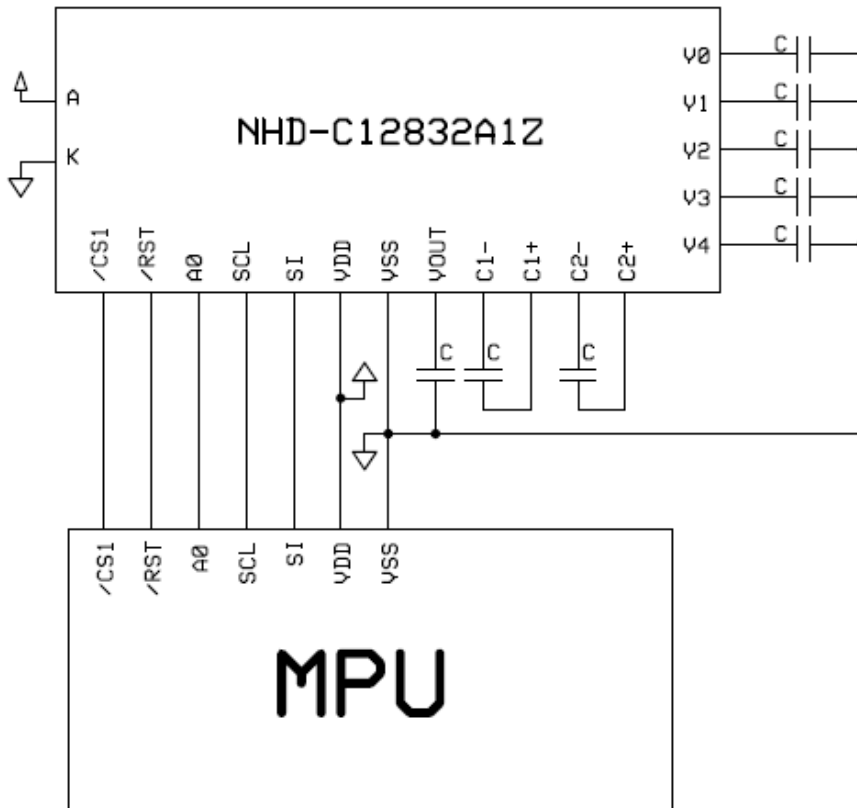
Pin No.	Symbol	External Connection	Function Description
1	V <sub>0</sub>	Power Supply	0.1μF – 1μF Capacitor to V <sub>SS</sub>
2	V <sub>1</sub>	Power Supply	0.1μF – 1μF Capacitor to V <sub>SS</sub>
3	V <sub>2</sub>	Power Supply	0.1μF – 1μF Capacitor to V <sub>SS</sub>
4	V <sub>3</sub>	Power Supply	0.1μF – 1μF Capacitor to V <sub>SS</sub>
5	V <sub>4</sub>	Power Supply	0.1μF – 1μF Capacitor to V <sub>SS</sub>
6	C2-	Power Supply	Connect 1μF – 2.2μF Capacitor to C2+ (pin 7)
7	C2+	Power Supply	Connect 1μF – 2.2μF Capacitor to C2- (pin 6)
8	C1+	Power Supply	Connect 1μF – 2.2μF Capacitor to C1- (pin 9)
9	C1-	Power Supply	Connect 1μF – 2.2μF Capacitor to C1+ (pin 8)
10	V <sub>OUT</sub>	Power Supply	Connect 1μF – 2.2μF Capacitor to V <sub>SS</sub> (pin 11)
11	V <sub>SS</sub>	Power Supply	Ground
12	V <sub>DD</sub>	Power Supply	Supply Voltage for LCD and Logic (+3V)
13	SI	MPU	Serial Data
14	SCL	MPU	Serial Clock
15	A0	MPU	Register Select. A0=0: Instruction, A0=1: Data
16	/RST	MPU	Active LOW Reset signal
17	/CS1	MPU	Active LOW Chip Select signal
A	LED+	Power Supply	Backlight Anode(+3V)
K	LED-	Power Supply	Backlight Cathode (Ground)

**Recommended LCD connector:** 1.5mm pitch pins, solder directly into PCB

**Backlight connector:** 1.2mm Wide pins, solder directly into PCB **Mates with:** ---

**Recommended Breakout Board:** [NHD-PCB12832A1Z](#)

## Wiring Diagram



## 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>	-	2.7	3.0	3.3	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> =3.0V	0.1	0.4	1.0	mA
Supply for LCD (contrast)	V <sub>LCD</sub>	T <sub>OP</sub> = 25°C	5.8	6.0	6.2	V
"H" Level input	V <sub>IH</sub>	-	0.8 * V <sub>DD</sub>	-	V <sub>DD</sub>	V
"L" Level input	V <sub>IL</sub>	-	V <sub>SS</sub>	-	0.2 * V <sub>DD</sub>	V
"H" Level output	V <sub>OH</sub>	-	0.8 * V <sub>DD</sub>	-	V <sub>DD</sub>	V
"L" Level output	V <sub>OL</sub>	-	V <sub>SS</sub>	-	0.2 * V <sub>DD</sub>	V
Backlight supply voltage	V <sub>LED</sub>	-	2.9	3.0	3.1	V
Backlight supply current	I <sub>LED</sub>	V <sub>LED</sub> =3.0V	10	30	36	mA

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	CR ≥ 2	-	20	-	°
	Bottom		-	40	-	°
	Left		-	40	-	°
	Right		-	40	-	°
Contrast Ratio	CR	-	2	6	-	-
Response Time	Rise	T <sub>OP</sub> = 25°C	-	200	250	ms
	Fall		-	250	320	ms

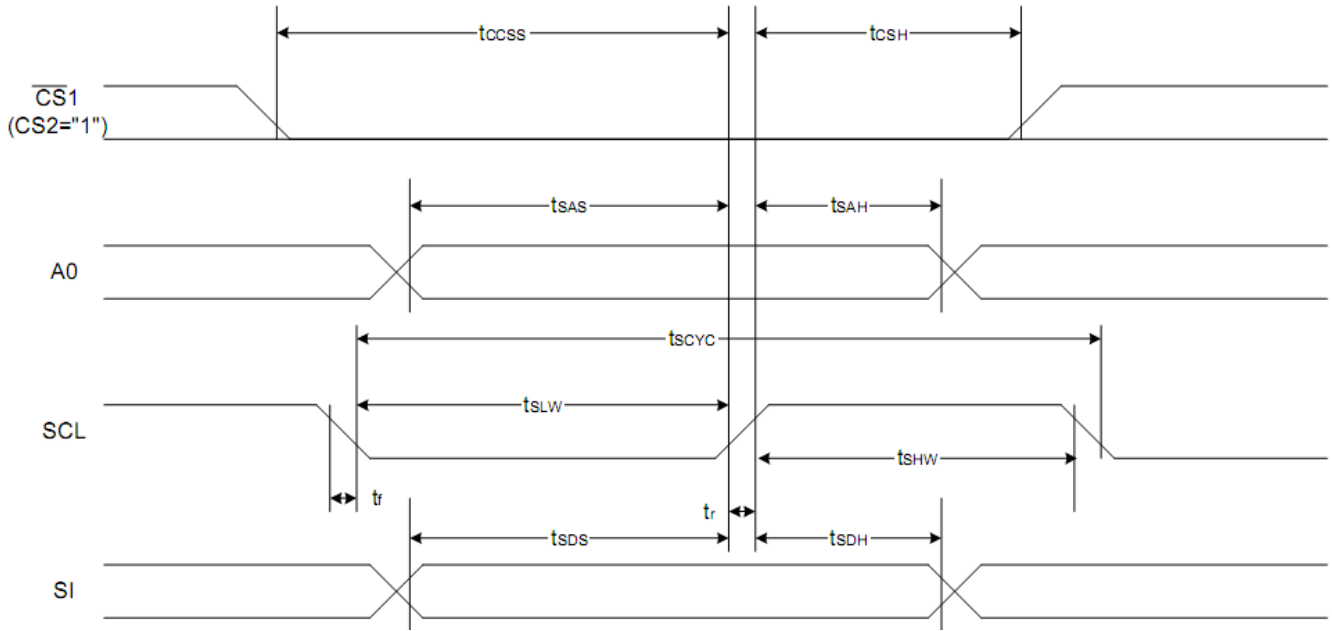
## Controller Information

Built-in ST7565R Controller: <https://support.newhavendisplay.com/hc/en-us/articles/4414899357591-ST7565R>



# Timing Characteristics

The 4-line SPI Interface

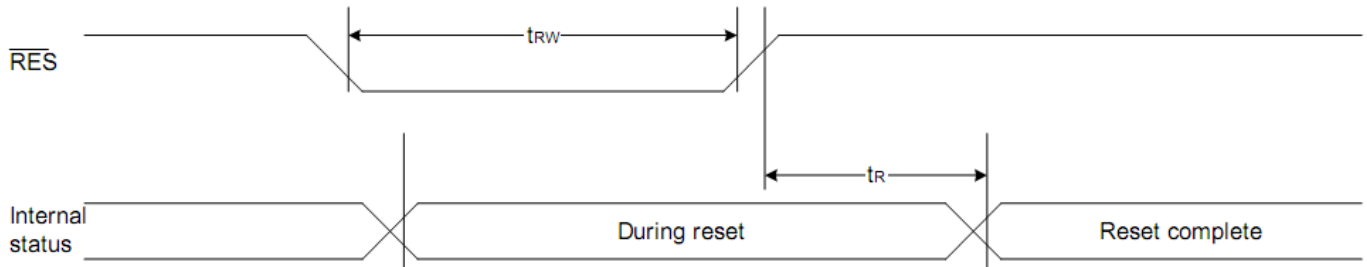


Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
4-line SPI Clock Period	SCL	$T_{scyc}$		50	—	ns
SCL "H" pulse width		$T_{shw}$		25	—	
SCL "L" pulse width		$T_{slw}$		25	—	
Address setup time	A0	$T_{sas}$		20	—	
Address hold time		$T_{sah}$		10	—	
Data setup time	SI	$T_{sds}$		20	—	
Data hold time		$T_{sdh}$		10	—	
CS-SCL time	CS	$T_{css}$		20	—	
CS-SCL time		$T_{csh}$		40	—	

\*1 The input signal rise and fall time ( $t_r$ ,  $t_f$ ) are specified at 15 ns or less.

\*2 All timing is specified using 20% and 80% of  $V_{DD}$  as the standard.

## Reset Timing



## Table of Commands

Command	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	LCD display ON/OFF 0: OFF, 1: ON	
(2) Display start line set	0	1	0	0	1	Display start address					0	Sets the display RAM display start line address		
(3) Page address set	0	1	0	1	0	1	Page address					0	Sets the display RAM page address	
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address					0	Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit				0	0	0	0	Least significant column address						Sets the least significant 4 bits of the display RAM column address.
(5) Status read	0	0	1	Status				0	0	0	0	0	Reads the status data	
(6) Display data write	1	1	0	Write data							0	Writes to the display RAM		
(7) Display data read	1	0	1	Read data							0	Reads from the display RAM		
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse	
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	1	Sets the LCD display normal/ reverse 0: normal, 1: reverse	
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	1	Display all points 0: normal display 1: all points ON	
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565R)	
(12) Read-modify-write	0	1	0	1	1	1	0	0	0	0	0	0	Column address increment At write: +1 At read: 0	
(13) End	0	1	0	1	1	1	0	1	1	1	0	0	Clear read/modify/write	
(14) Reset	0	1	0	1	1	1	0	0	0	0	1	0	Internal reset	
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	1	Select COM output scan direction 0: normal direction 1: reverse direction	
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			0	Select internal power supply operating mode	
(17) V <sub>0</sub> voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			0	Select internal resistor ratio(Rb/Ra) mode	
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	0	1	Set the V <sub>0</sub> output voltage electronic volume register	
Electronic volume register set				0	0	Electronic volume value								
(19) Sleep mode set	0	1	0	1	0	1	0	1	1	0	0	1	0: Sleep mode, 1: Normal mode	
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x	
(21) NOP	0	1	0	1	1	1	0	0	0	0	1	1	Command for non-operation	
(22) Test	0	1	0	1	1	1	1	*	*	*	*	*	Command for IC test. Do not use this command	

## Example Initialization Program

```

void data_out(unsigned char i) //Data Output Serial Interface
{
    unsigned int n;
    CS = 0;
    A0 = 1;
    for(n=0; n<8; n++){
        i <<=1;
        SCL = 0;
        P1 = i;
        delay(2);
        SCL = 1;
    }
    CS = 1;
}

void comm_out(unsigned char j) //Command Output Serial Interface
{
    unsigned int n;
    CS = 0;
    A0 = 0;
    for(n=0; n<8; n++){
        j <<=1;
        SCL = 0;
        P1 = j;
        delay(2);
        SCL = 1;
    }
    CS = 1;
}

/*****
*   Initialization For controller   *
*****/
void init_LCD()
{
    comm_out(0xA0);
    comm_out(0xAE);
    comm_out(0xC0);
    comm_out(0xA2);
    comm_out(0x2F);
    comm_out(0x21);
    comm_out(0x81);
    comm_out(0x3F);
}
/*****/

```

## 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, 96hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C, 96hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C, 96hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C, 96hrs	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, 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 -> 70°C, 60min = 1 cycle For 20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz, 5G amplitude. 30min in each of 3 directions X, Y, Z	3
Static electricity test	Endurance test applying electric static discharge.	Air: ±8kV 150pF/330Ω, 5 Times	
		Contact: ±4kV 150pF/330Ω, 5 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.

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- [View NHD-C12832A1Z-FSB-FBW-3V3 on WIN SOURCE](#)
- [Newhaven Information](#)

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- ✓ Cost Control Management
- ✓ Shortage Management
- ✓ Alternative Solution
- ✓ Excess Inventory Management