

Product Specification

NHD-12864DA-FSW-FBW-3V3

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

NHD-	Newhaven Display
12864-	128 x 64 Pixels
DA-	Model
F-	Transflective
SW-	Side White LED Backlight
F-	FSTN (+)
B-	6:00 Optimal View
W-	Wide Temperature
3V3-	3.0V LCD, 3.0V Backlight

Table of Contents

Document Revision History.....	2
Mechanical Drawing	3
Pin Description	4
Wiring Diagram	4
Electrical Characteristics	5
Optical Characteristics	5
Controller Information.....	5
Timing Characteristics.....	6
Example Initialization Program	10
Quality Information.....	11

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
- **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
-	09/22/2024	Initial Release	KL
1	04/02/2025	Updated Electrical/Optical Characteristics and Mechanical Drawing	KL

Mechanical Drawing

NEWHAVEN DISPLAY
NHD-C12864DA-FSW-FBW-3V3_Rev1A
LOT-YYWW

VIEWING DIRECTION

CIRCUIT DIAGRAM:

DOT DETAIL SCALE 20:1

1	2	3	4	5	6	7	8	9	10	11	12	13	14
CS1	/RES	A0	/WR	/RD	DO	D1	D2	D3	D4	D5	D6	D7	VDD
15	16	17	18	19	20	21	22	23	24	25	26	27	28
VSS	VOUT	CAP3P	CAP1N	CAP1P	CAP2P	CAP2N	V4	V3	V2	V1	V0	C86	P/S

Product Description: 128x64 Graphic COG LCD

- Driver IC: ST7565R
- Driving Mode: 1/65 Duty, 1/9 Bias
- Interface: 8-bit 6800/8080 Parallel, 4-wire SPI
- Power Requirement: 3.0V LCD
- Optical Features: FSTN (+), Transflective, 6:00 View, White Backlight

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

Unless otherwise specified:
• Dimensions are in Millimeters
• Third Angle Projection

NEWHAVEN DISPLAY INTERNATIONAL

Drawing/Part Number:
NHD-C12864DA-FSW-FBW-3V3

Revision:
1A

Drawn By: K. Lewis
Approved By: K. Lewis

Draw Date: 02/21/2025
Approved Date: 02/21/2025

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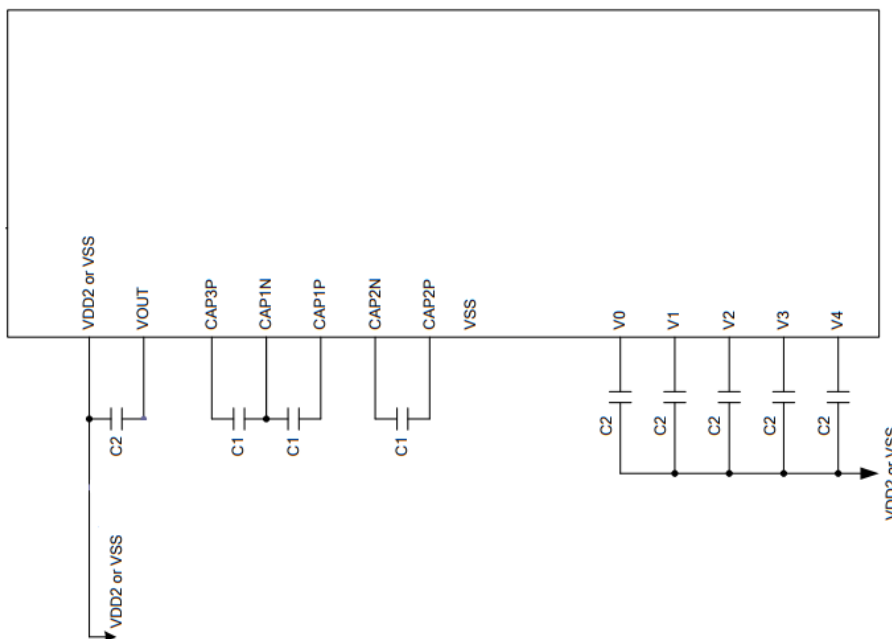
Pin Description

Pin No.	Symbol	External Connection	Function Description
1	CS1B	MPU	Active LOW Chip select
2	/RES	MPU	Active LOW Reset signal
3	A0	MPU	Register select signal. A0=1: Data; A0=0: Command
4	R/W /WR	MPU	6800 Mode: Read/Write select signal. R/W=1: Read R/W=0: Write 8080 Mode: Active LOW Write signal
5	E /RD	MPU	6800 Mode: Active High Enable signal 8080 Mode: Active LOW Read signal
6-13	D0-D7	MPU	Parallel interface: 8-bit directional data bus Serial interface: DB0-DB5 = No Connect D6=Serial clock (SCL) D7= Serial Data (SI)
14	VDD	Power Supply	Supply voltage for LCD and logic (+3.0V)
15	VSS	Power Supply	Ground
16	VOOUT	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to VDD or VSS
17	CAP3+	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP1- (pin 18)
18	CAP1-	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP1+ (pin 19) and CAP3+ (pin 17)
19	CAP1+	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP1- (pin 18)
20	CAP2+	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP2- (pin 21)
21	CAP2-	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP2+ (pin 20)
22-26	V4-V0	Power Supply	0.1 μ F – 1 μ F Capacitor to VDD or VSS
27	C86	MPU	MPU Interface select signal. C86=1: 6800; C86=0: 8080
28	P/S	MPU	Interface Mode select signal. P/S=1: Parallel; P/S=0: Serial
A	LED-A	Power Supply	Backlight Anode(60mA)
K	LED-K	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 1.27mm pitch pins, solder directly into PCB

Recommended Breakout Board: NHD-PCB40

Wiring Diagram



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}	-	2.7	3.0	3.3	V
Supply Current	I _{DD}	T _{OP} = 25°C, V _{DD} = 3.0V	-	0.5	1.5	mA
Supply for LCD (contrast)	V _{LCD}	T _{OP} = 25°C	8.6	8.8	9.0	V
"H" Level input	V _{IH}	-	0.8 * V _{DD}	-	V _{DD}	V
"L" Level input	V _{IL}	-	V _{SS}	-	0.2 * V _{DD}	V
"H" Level output	V _{OH}	-	0.8 * V _{DD}	-	V _{DD}	V
"L" Level output	V _{OL}	-	V _{SS}	-	0.2 * V _{DD}	V
Backlight supply voltage	V _{LED}	I _{LED} = 60	3.0	3.2	3.4	V
Backlight supply current	I _{LED}	-	-	60	-	mA

Optical Characteristics

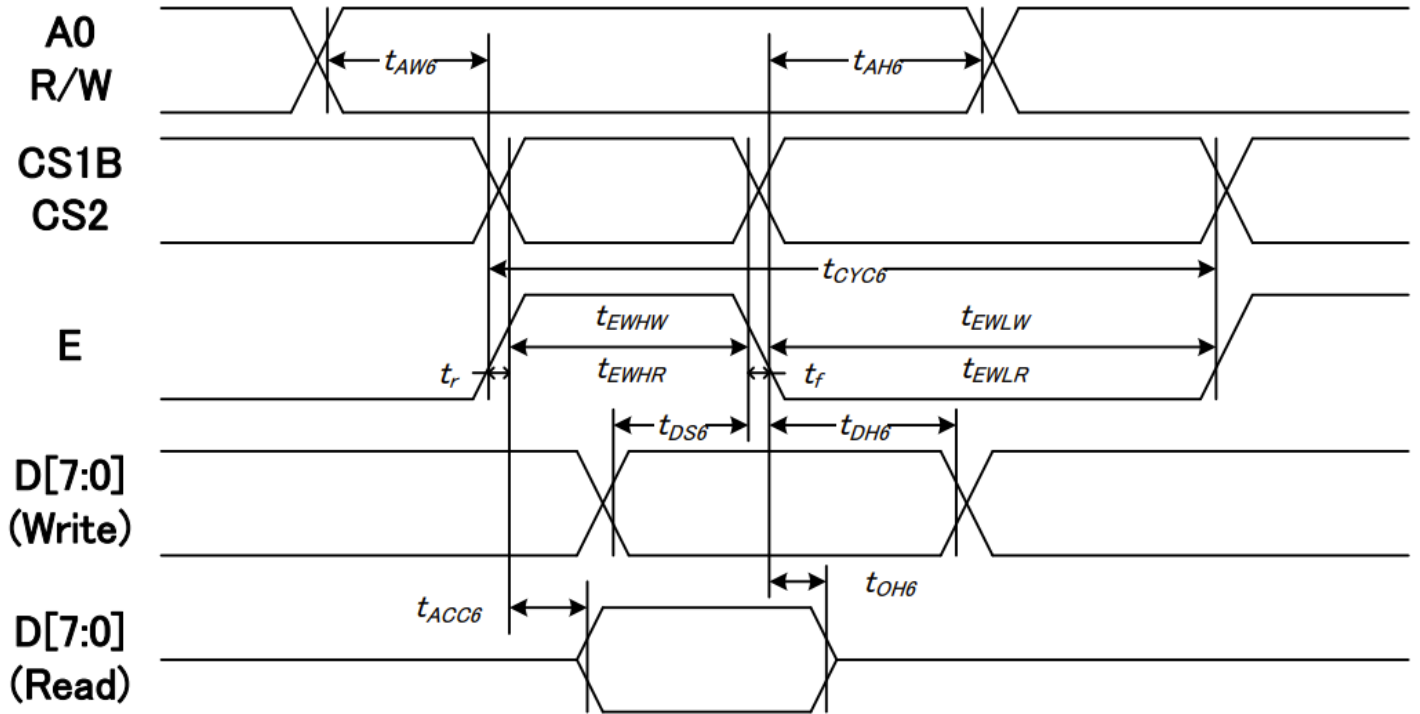
Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 2	-	40	-	°
	Bottom	φY-		-	30	-	°
	Left	θX-		-	30	-	°
	Right	θX+		-	30	-	°
Contrast Ratio		CR	-	2	4.1	-	-
Response Time	Rise	T _R	T _{OP} = 25°C	-	155	250	ms
	Fall	T _F		-	185	300	ms

Controller Information

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

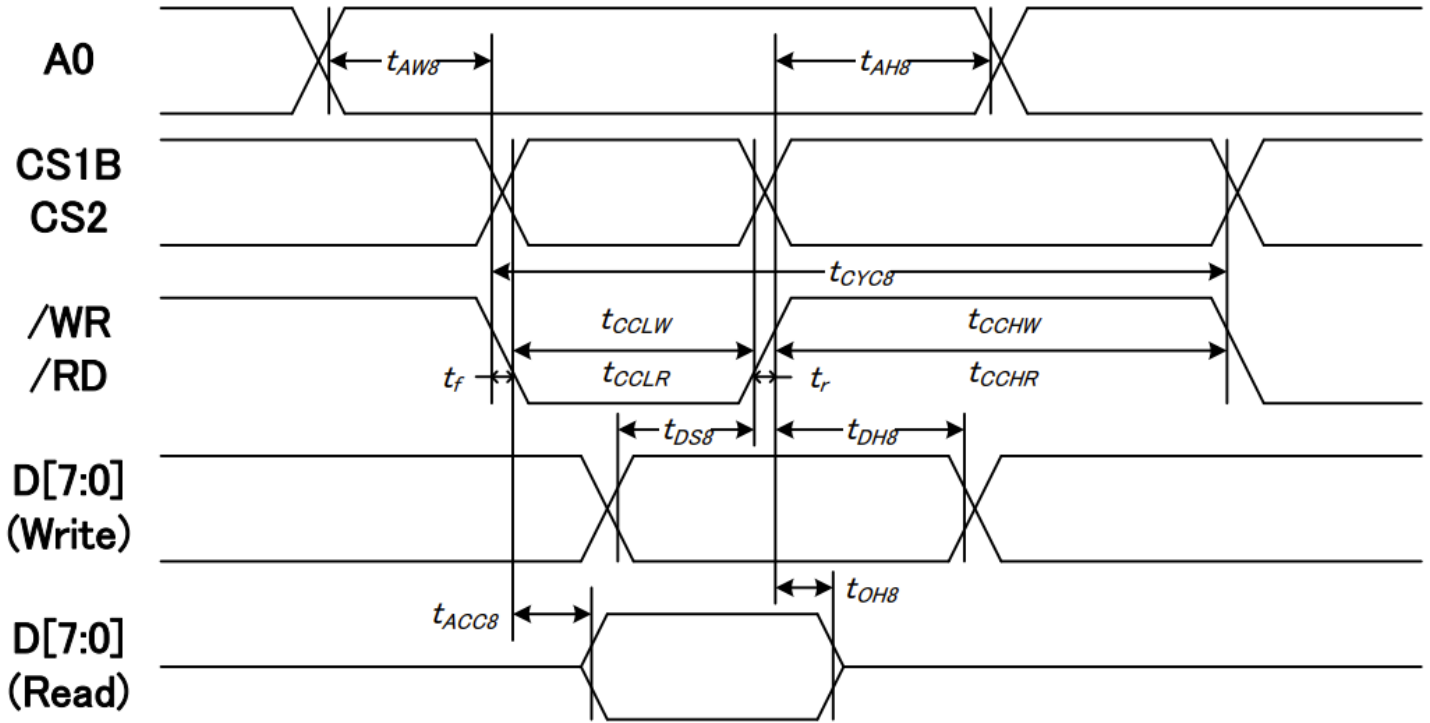
Timing Characteristics

System Bus Timing for 6800 Series MPU



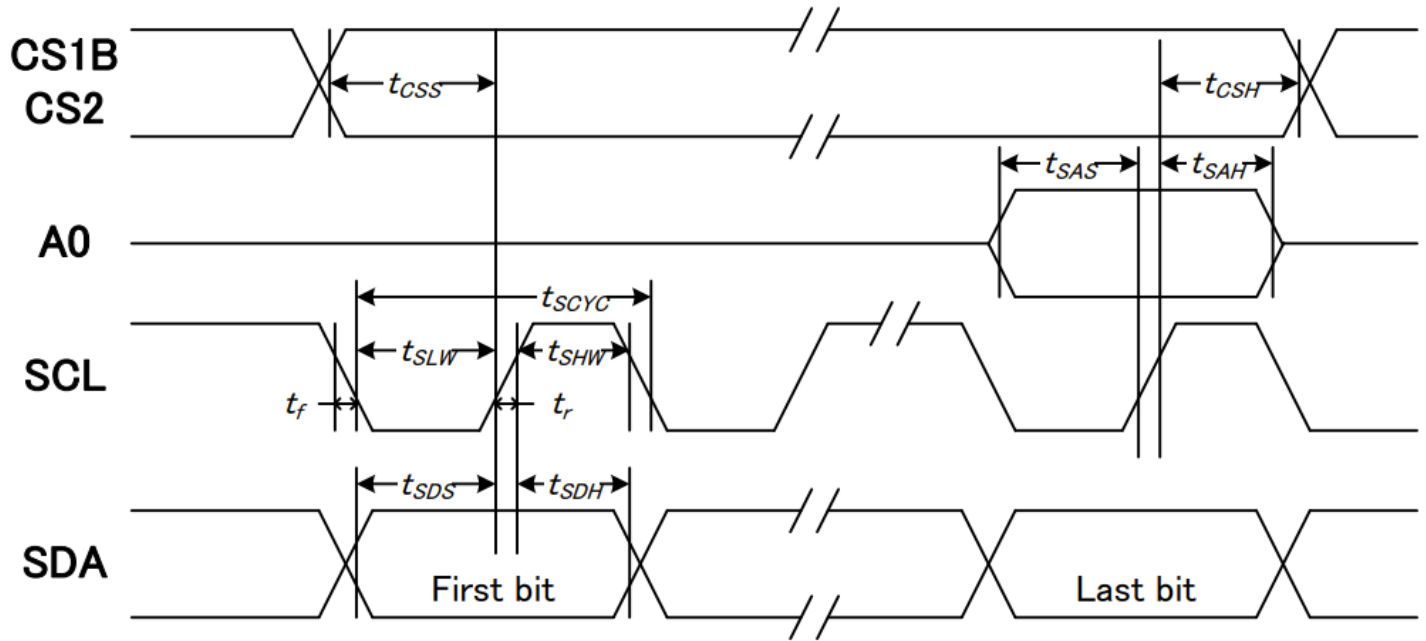
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	t_{AW6}		0	—	ns
Address hold time		t_{AH6}		0	—	
System cycle time	E	t_{CYC6}		240	—	
Enable L pulse width (WRITE)		t_{EHLW}		80	—	
Enable H pulse width (WRITE)		t_{EHLH}		80	—	
Enable L pulse width (READ)		t_{EHLR}		80	—	
Enable H pulse width (READ)	D[7:0]	t_{EHLH}		140	—	
Write data setup time		t_{DS6}		40	—	
Write data hold time		t_{DH6}		10	—	
Read data access time		t_{ACC6}	CL = 100 pF	—	70	
Read data output disable time		t_{OH6}	CL = 100 pF	5	50	

System Bus Timing for 8080 Series MPU



Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW8		0	—	ns
Address hold time		tAH8		0	—	
System cycle time	/WR	tCYC8		240	—	
/WR L pulse width (WRITE)		tCCLW		80	—	
/WR H pulse width (WRITE)		tCCHW		80	—	
/RD L pulse width (READ)	RD	tCCLR		140	—	
/RD H pulse width (READ)		tCCHR		80	—	
WRITE Data setup time	D[7:0]	tDS8		40	—	
WRITE Data hold time		tDH8		20	—	
READ access time		tACC8	CL = 100 pF	—	70	
READ Output disable time		tOH8	CL = 100 pF	5	50	

System Bus Timing for 4-Wire SPI

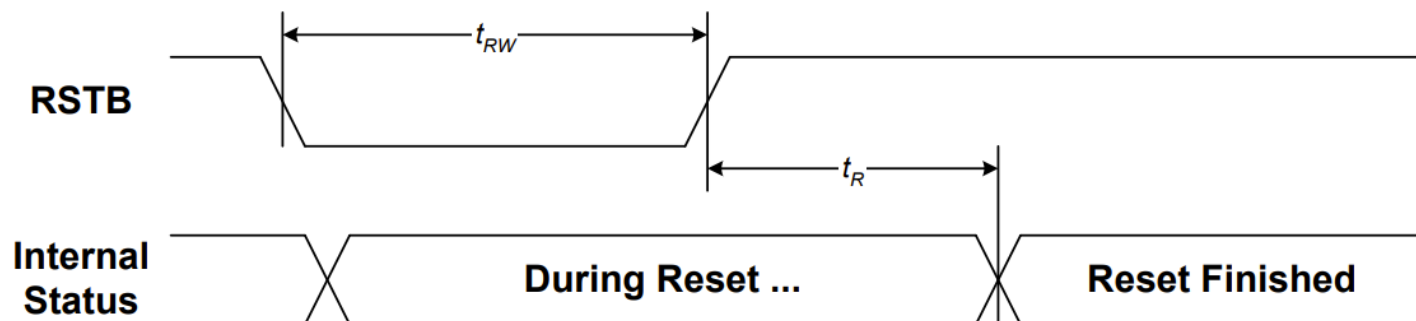


Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		50	—	ns
SCLK "H" pulse width		tSHW		25	—	
SCLK "L" pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CS-SCLK time	CS1B	tCSS		20	—	
CS-SCLK time	CS2	tCSH		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



Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	us
Reset “L” pulse width	tRW		1.0	—	

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, 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, 5 min-> 70°C, 30min = 1 cycle 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz, 1.5mm amplitude. 2g Acceleration. 60 sec in each of 3 directions X, Y, Z for 30 minutes	3
Static electricity test	Endurance test applying electric static discharge.	Air: ±8kV	
		Contact: ±4kV	

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.