NHD-C12864A1Z-FSW-FBW-HTT

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

NHD-	Newhaven Display
C12864-	128 x 64 Pixels
A1Z-	Model
F-	Transflective
SW-	Side White LED Backlight
F-	FSTN (+)
B-	6:00 Optimal View
W-	Wide Temp
HTT-	With 12V Heater (-40°C to +70°C)
	RoHS Compliant

Document Revision History

Revision	Date	Description	Changed by
0	7/17/2008	Initial Release	-
1	9/28/2009	User guide reformat	BE
2	10/14/2009	Updated Electrical Characteristic	MC
3	11/20/2009	Updated backlight supply current	MC
4	10/26/2010	Updated backlight current	BE
5	10/27/2010	Supply current updated	BE
6	08/31/2015	Electrical characteristics, Optical characteristics, Mechanical drawings updated	SB
7	8/3/2016	Updated Electrical Characteristics and Quality Info	TM
8	9/23/16	Updated Electrical Characteristics	TM

Functions and Features

- **128 x 64 pixels**
- **Built-in ST7565P controller**
- **+3.3V power supply**
- **1/65 duty cycle; 1/9 bias**
- **Built-in Heater**
- **RoHS Compliant**

Mechanical Drawing

Pin assignment	
NO.	Symbol
1	SCL
2	SI
3	VDD
4	A0
5	/RESET
6	/CS
7	VSS
8	H−
9	H+
10	LED−
11	LED+
12	NC

Rev	Description	Date

128*64 DOTS

Viewing direction

Tear Tape

B/L 80±0.2
LCD 77.8±0.2
(V.A 70.7 MIN)
(A.A 66.52)
(1.1)
(4.65)
(6.74)

B/L 54±0.2
LCD 50.5±0.2
LCD 44.5±0.2
(V.A 38.8MIN)
(A.A 35.24)

1.1
(3.95)
(6.73)

1.2
3

4.2   21.8   28   21.8
59.68

1   6   7   12

B/L 10.2 +0.5/−0.2
LCD 2.1(MAX)
7±0.2
4.8
5
43.2±0.2

FRONT   BACK

0.6   12.7
2−∅0.6
∅0.51

78±0.2
73±0.2

2−∅2
20.5

Protect tape

12   7   6   1

78±0.2

FRONT

BACK

3.2
1.7
0.5

7.62   P2.54*5=12.7   P2.54*5=12.7   7.62

1
1.6

SEG0   SEG127
COM63
COM32
COM31
COM0

0.52
0.48
0.52
0.48

DOTS DETAIL
SCALE 10:1

0.1±0.3

Detail Viewing "A"
SCALE 4:1

0.1±0.3

0.1±0.3

Detail Viewing "B"
SCALE 4:1

	Date 08/31/15	NEWHAVEN DISPLAY INTERNATIONAL
Gen. Tolerance ±0.3mm	Unit mm	Model: NHD-C12864A1Z-FSW-FBW-HTT

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	SCL	MPU	Serial Clock input
2	SI	MPU	Serial Data input
3	VDD	Power Supply	Supply Voltage for LCD and logic (+3.3V)
4	A0	MPU	Register Select. 0: instruction; 1: data
5	/RESET	MPU	Operation Active LOW Reset signal
6	/CS	MPU	Active LOW Chip Select Signal
7	Vss	Power Supply	Ground
8	H-	Power Supply	Ground for Heater
9	H+	Power Supply	Power for Heater (+12V)
10	LED-	Power Supply	Backlight Cathode (Ground)
11	LED+	Power Supply	Backlight Anode (+3.3V)
12	NC	-	No Connect

Recommended LCD connector: 2.54mm pitch thru-hole connection on PCB
**Backlight connector:** ---   **Mates with**: ---
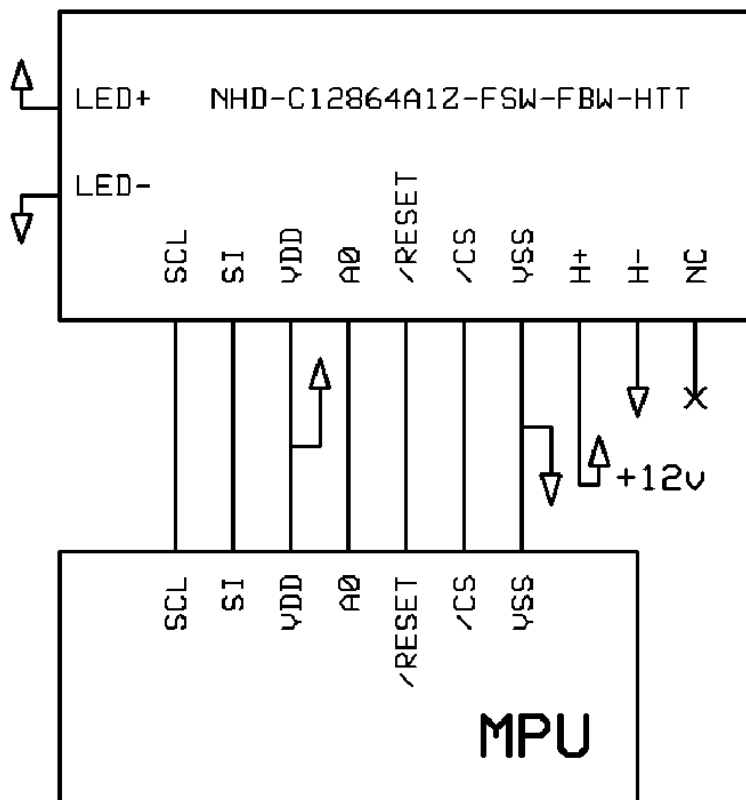
Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T_{OP}	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T_{ST}	Absolute Max	-40	-	+80	°C
Supply Voltage	V_{DD}	-	3.0	3.3	3.3	V
Supply Current	I_{DD}	V_{DD}=3.3V	0.1	0.31	0.5	mA
Supply for LCD (contrast)	V_{LCD}	T_{OP} = 25°C	8.8	9.0	9.2	V
"H" Level input	V_{IH}	-	0.8*V_{DD}	-	V_{DD}	V
"L" Level input	V_{IL}	-	0	-	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}	-	-	3.3	-	V
Backlight Supply Current	I_{LED}	V_{LED}=3.3V	30	50	60	mA
Heater panel resistance	R_H+/-	-	-	20	25	Ω
Heater Voltage Supply	V_H	-	-	12V	-	V
Heater Current	I_H	V_H=12.0V	0.48	0.60	1	A

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 3	-	20	-	º
	Bottom	φY-		-	40	-	º
	Left	θX-		-	40	-	º
	Right	θX+		-	40	-	º
Contrast Ratio		CR	-	2	4	10	-
Response Time	Rise	T_R	T_{OP} = 25°C	150	200	300	ms
	Fall	T_F		200	250	350	ms

Heater Circuit Example:
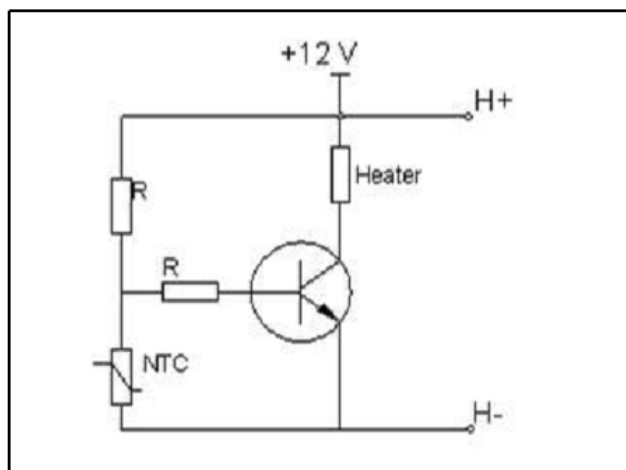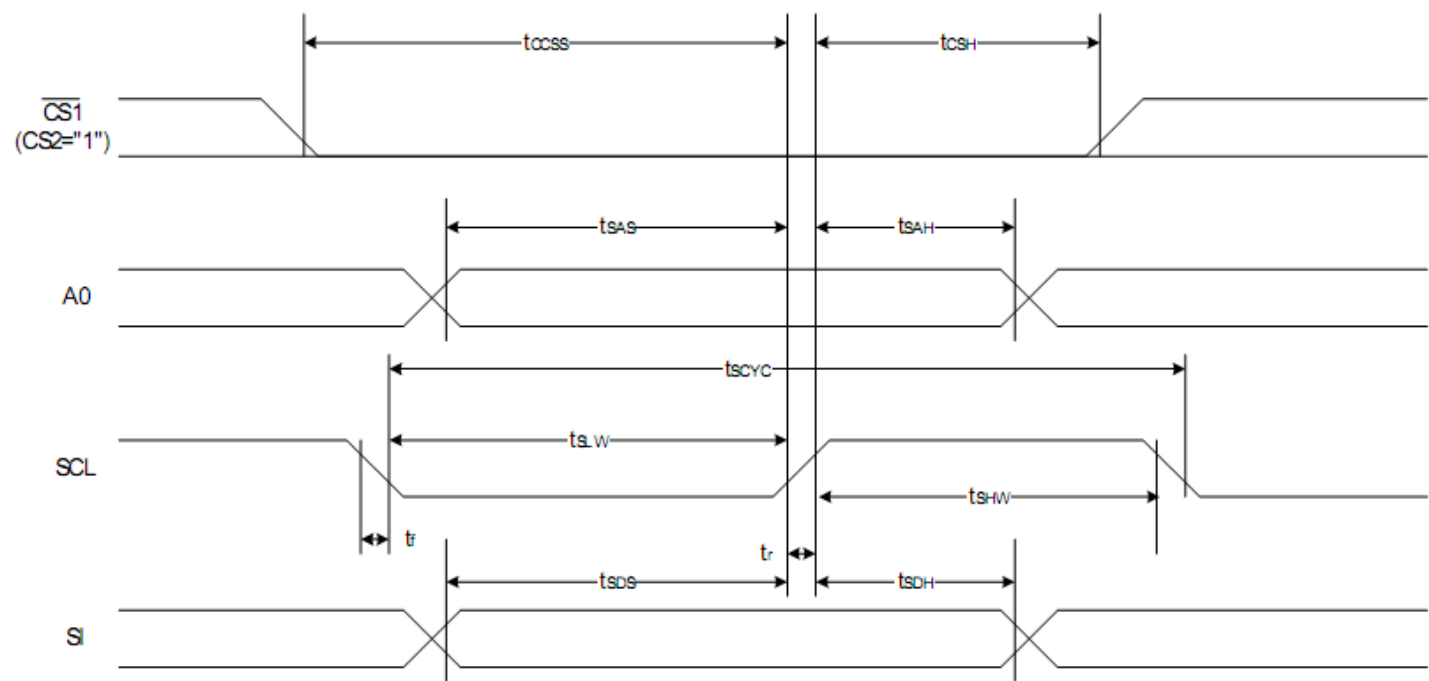

Controller Information

Built-in ST7565P controller.
Please download specification at http://www.newhavendisplay.com/app_notes/ST7565.pdf

Timing Characteristics

The Serial Interface

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period		t_{SCYC}		400	—	
SCL "H" pulse width	SCL	t_{SHW}		120	—	
SCL "L" pulse width		t_{SLW}		120	—	
Address setup time	A0	t_{SAS}		50	—	
Address hold time		t_{SAH}		50	—	ns
Data setup time	SI	t_{SDS}		50	—	
Data hold time		t_{SDH}		50	—	
CS-SCL time	CS	t_{CSS}		50	—	
CS-SCL time		t_{CSH}		150	—	
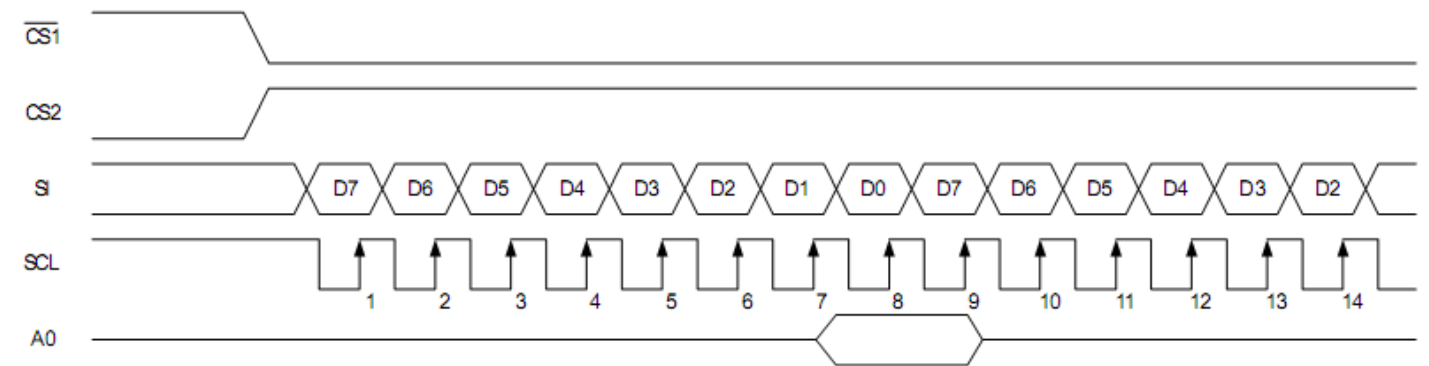
Table of Commands

Command	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
(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						Sets the display RAM display start line address
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit	0	1	0	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	Reads the status data
(6) Display data write	1	1	0	Write data								Writes to the display RAM
(7) Display data read	1	0	1	Read data								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 (ST7565)
(12) Read/modify/write	0	1	0	1	1	1	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	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	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			Select internal power supply operating mode
(17) V₅ voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the V₅ output voltage electronic volume register
Electronic volume register set				0	0	Electronic volume value						
(19) Static indicator ON/OFF	0	1	0	1	0	1	0	1	1	0	0 / 1	0: OFF, 1: ON
Static indicator register set				0	0	0	0	0	0	Mode		Set the flashing mode
(20) Power saver												Display OFF and display all points ON compound command
(21) NOP	0	1	0	1	1	1	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

```
'""""""""""""""""""""""""""""""""""""""
Sub Command
 Reset P3.7
 Reset P3.4
 For Writecount = 1 To 8
  Rotate A , Left , 1
  Reset P3.1
  P1 = A
  Set P3.1
 Next Writecount
 Set P3.7
End Sub
'""""""""""""""""""""""""""""""""""""""
Sub Write
 Reset P3.7
 Set P3.4
 For Writecount = 1 To 8
  Rotate A , Left , 1
  Reset P3.1
  P1 = A
  Set P3.1
 Next Writecount
 Set P3.7
End Sub
'""""""""""""""""""""""""""""""""""""""
Sub Init
 Waitms 100
 A = &HA0
 Call Command
 A = &HAE
 Call Command
 A = &HC0
 Call Command
 A = &HA2
 Call Command
 A = &H2F
 Call Command
 A = &H26
 Call Command
 A = &H81
 Call Command
 A = &H11
 Call Command
 A = &HAF
 Call Command
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 , 96hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40°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.	-40°C /-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.	+50°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.	-40°C /-20°C , 60min --> 70°C , 60min = 1 cycle For 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz , Acceleration of Gravity:5G 30 min in each of 3 directions X,Y,Z For 15 minutes	3
Static electricity test	Endurance test applying electric static discharge.	VS= ±4KV, RS=330Ω, CS=150pF For 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.

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