

NHD-C12864EZ-FSW-FTW-P

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

NHD-	Newhaven Display
C12864-	128 x 64 pixels
EZ-	Model
F-	Transflective
SW-	Side White LED backlight
F-	FSTN (+)
T-	12:00 view
W-	Wide Temp (-20°C ~ +70°C)
P-	8-Pin connector
	RoHS Compliant

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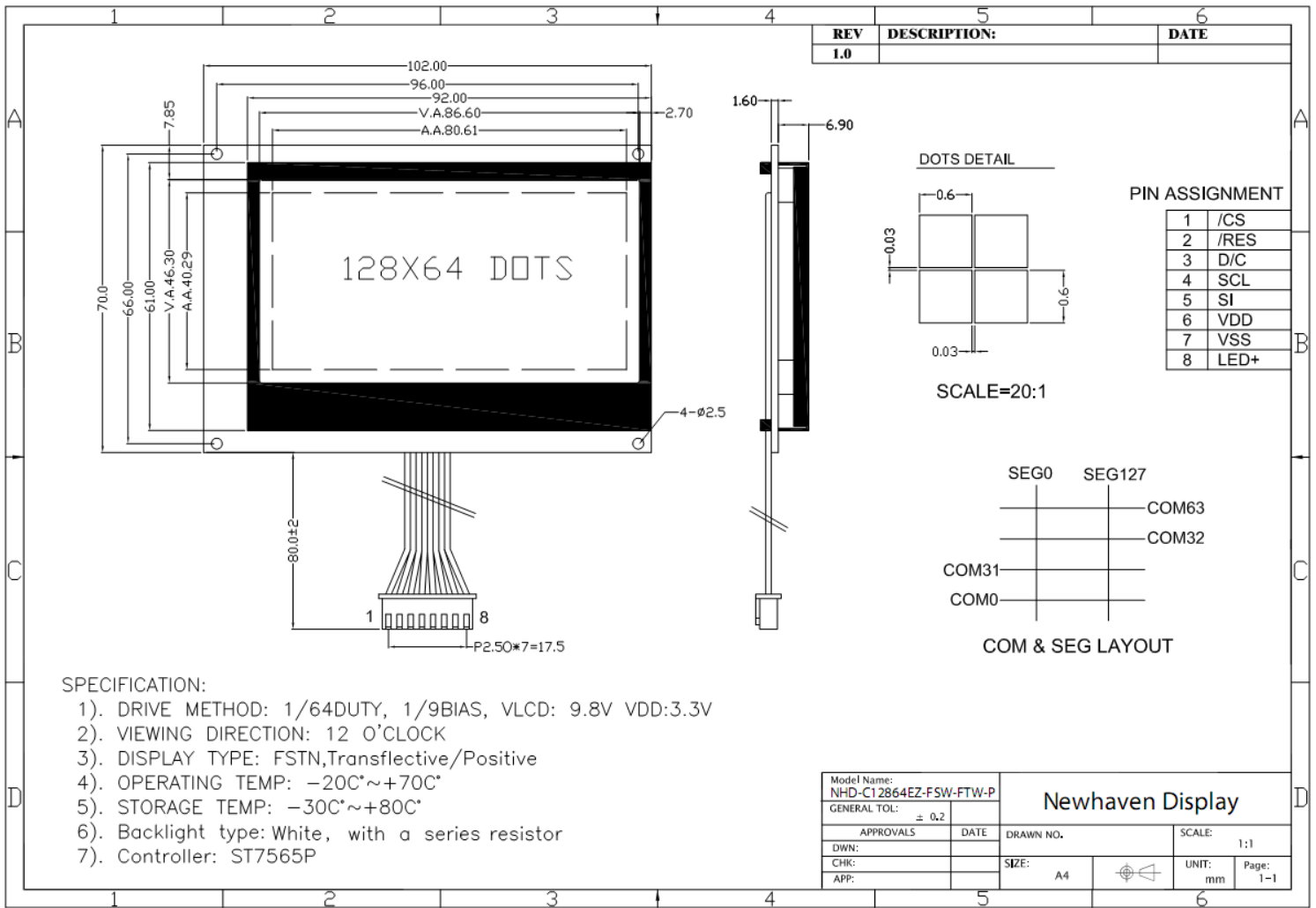
Document Revision History

Revision	Date	Description	Changed by
0	7/27/2007	Initial Release	-
1	9/24/2009	User guide reformat	BE
2	10/14/2009	Updated Electrical Characteristic	MC
3	11/20/2009	Updated backlight supply current max	MC
4	12/08/2009	Changed Backlight supply current from 3.3V to 5.0V	MC
5	12/21/2009	Connector info updated	BE

Functions and Features

- 128 x 64 Pixels
- Built-in ST7565 controller
- 3.3V Power Supply
- 1/64 duty cycle; 1/9 bias
- Serial Interface
- RoHS Compliant

Mechanical Drawing

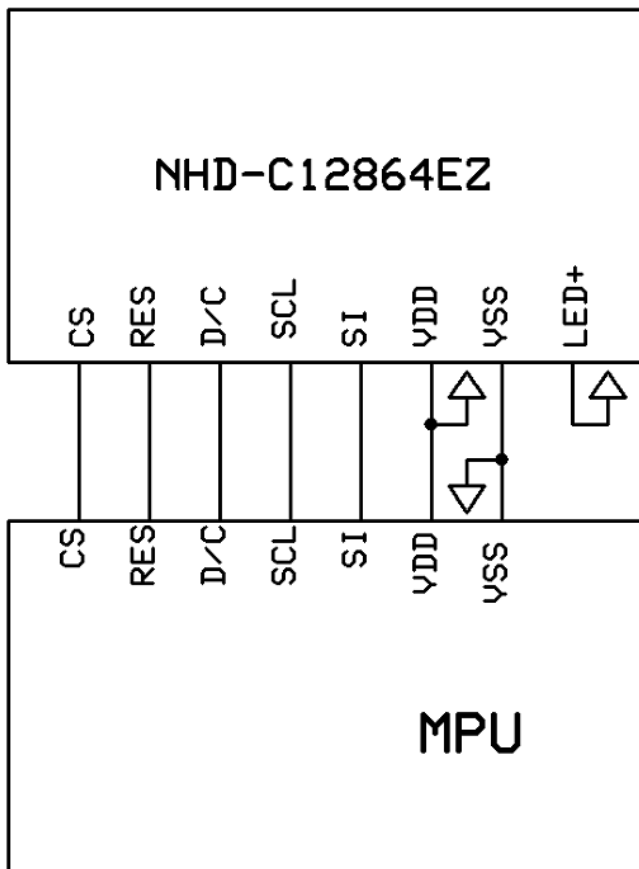


Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	/CS	MPU	Active LOW chip select
2	/RESET	MPU	Active LOW Reset signal
3	D/C	MPU	Register select signal 1=Data, 0=Command
4	SCL	MPU	Serial clock input
5	SI	MPU	Serial data input
6	VDD	Power Supply	Power supply for logic (+3.3V)
7	Vss	Power Supply	Ground
8	LED+	Power Supply	Power supply for backlight (+5.0)

Recommended LCD connector: JST p/n: XHP-8 or equivalent

Backlight connector: on LCD connector **Recommended Mating connector:** JST p/n: B8B-XH-A



Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	TOP	Absolute Max	-20	-	+70	°C
Storage Temperature Range	TST	Absolute Max	-30	-	+80	°C
Supply Voltage	VDD		2.4	3.3	3.3	V
Supply Current	IDD	Ta=25°C VDD=3.3V	-	-	147	uA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	9.5	9.8	10.2	V
"H" Level input	Vih		2.2	-	VDD	V
"L" Level input	Vil		0	-	0.6	V
"H" Level output	Voh		2.4	-	-	V
"L" Level output	Vol		-	-	0.4	V
Backlight Supply Voltage	VLED		-	5.0	-	V
Backlight Supply Current	ILED	VLED=5.0V	-	16	25	mA

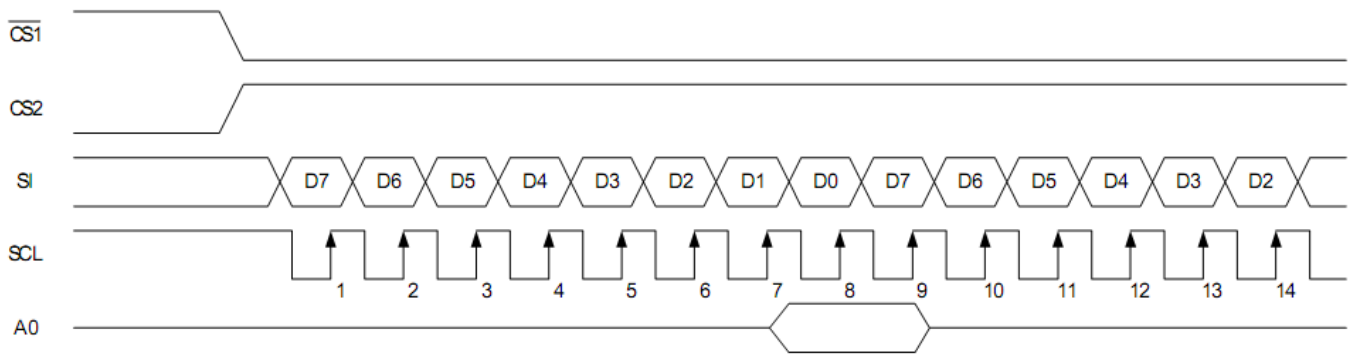
Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical	θ	CR \geq 2	-60	-	+35	°
Viewing Angle - Horizontal	Φ	CR \geq 2	-40	-	+40	°
Contrast Ratio	CR		-	6	-	-
Response Time (rise)	Tr		-	150	250	ms
Response Time (fall)	Tf		-	150	250	ms

Controller Information

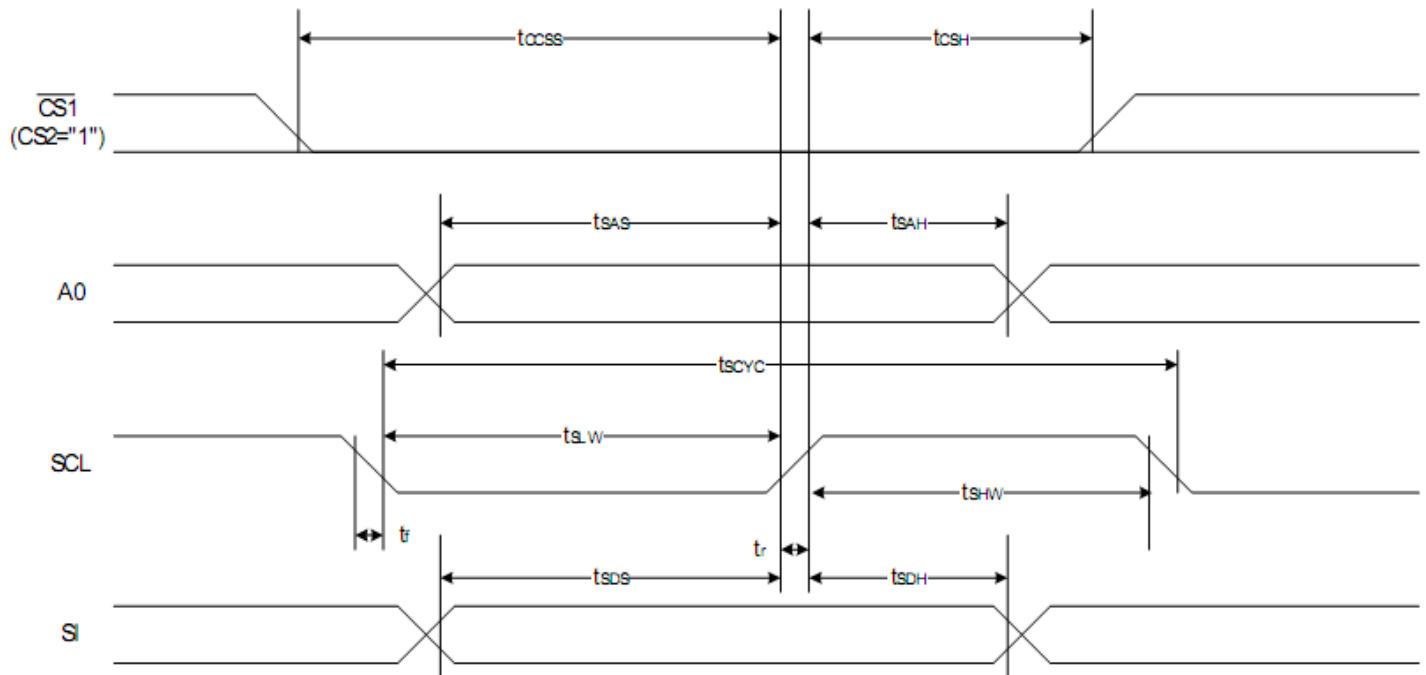
Built-in ST7565. Download specification at http://www.newhavendisplay.com/app_notes/ST7565.pdf

The Serial Interface



Timing Characteristics

The Serial Interface



Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Serial Clock Period	SCL	t_{SCLCYC}		400	—	ns
SCL "H" pulse width		t_{SCHW}		120	—	
SCL "L" pulse width		t_{SCLW}		120	—	
Address setup time	A0	t_{SAS}		50	—	
Address hold time		t_{SAH}		50	—	
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	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						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. Sets the least 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					
(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								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	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	1	0	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) Vs 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	0	1	Set the Vs 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	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	1	Command for non-operation
(22) Test	0	1	0	1	1	1	1	*	*	*	*	*	Command for IC test. Do not use this command

(Note) *: disabled data

Example Initialization Program

```
/******  
void data_out(unsigned char i) //Data Output Serial Interface  
{  
    unsigned int n;  
    unsigned char d;  
    d=i;  
    CS = 0;  
    A0 = 1;  
    for(n=0;n<8;n++){ //send 8 bits  
        if((d&0x80)==0x80) //get only the MSB  
            SI=1; //if 1, then SI=1  
        else  
            SI=0; //if 0, then SI=0  
        d=(d<<1); //shift data byte left  
        SCL = 0;  
        SCL = 1;  
        SCL = 0;  
    }  
    CS = 1;  
}  
void comm_out(unsigned char j) //Command Output Serial Interface  
{  
    unsigned int n;  
    unsigned char d;  
    d=j;  
    CS = 0;  
    A0 = 0;  
    for(n=0;n<8;n++){ //send 8 bits  
        if((d&0x80)==0x80) //get only the MSB  
            SI=1; //if 1, then SI=1  
        else  
            SI=0; //if 0, then SI=0  
        d=(d<<1); //shift data byte left  
        SCL = 0;  
        SCL = 1;  
        SCL = 0;  
    }  
    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(0x26);  
    comm_out(0x81);  
    comm_out(0x22);  
    comm_out(0xAF);  
}  
/******
```


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

Warranty Information and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms