

# NHD-C12864B2Z-RN-FBW

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

NHD- Newhaven Display  
C12864- 128 x 64 Pixels  
B2Z- Model  
R- Reflective  
N- No Backlight  
F- FSTN, Positive  
B- 6:00 Optimal View  
W- Wide Temp  
**RoHS Compliant**

**Newhaven Display International, Inc.**

2661 Galvin Ct.

Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

[www.newhavendisplay.com](http://www.newhavendisplay.com)

[nhtech@newhavendisplay.com](mailto:nhtech@newhavendisplay.com)

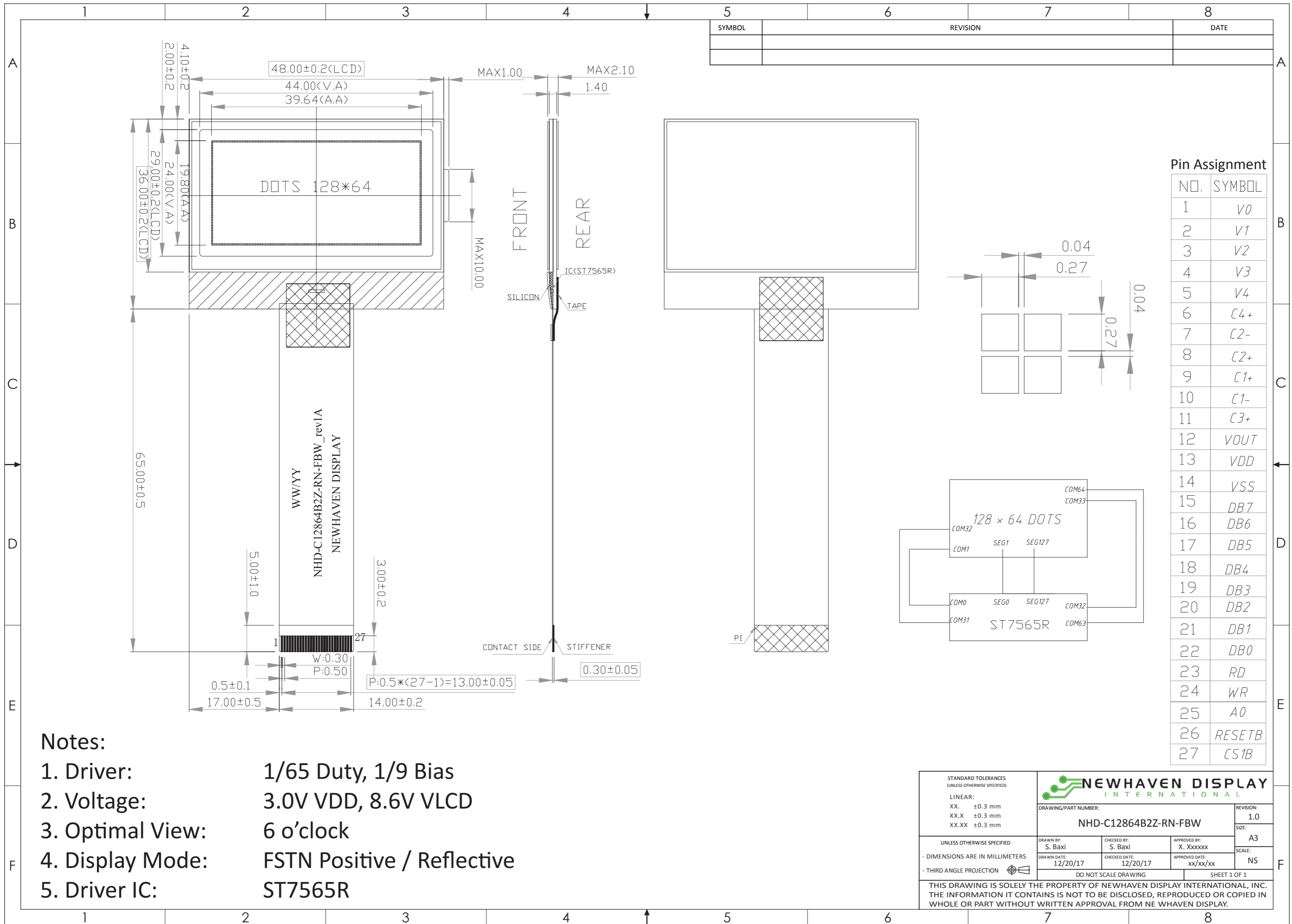
[nhsales@newhavendisplay.com](mailto:nhsales@newhavendisplay.com)

## Document Revision History

Revision	Date	Description	Changed by
0	5/12/2008	Initial Release	-
1	3/18/2009	User guide reformat	-
2	7/14/2009	User guide reformat	BE
3	5/10/2011	Code Update	JT
4	11/7/2011	Example program updated	AK
5	8/25/16	Mechanical Drawing, Electrical & Optical Char. Updated	SB
6	3/27/18	Mechanical Drawing Updated	SB

## Functions and Features

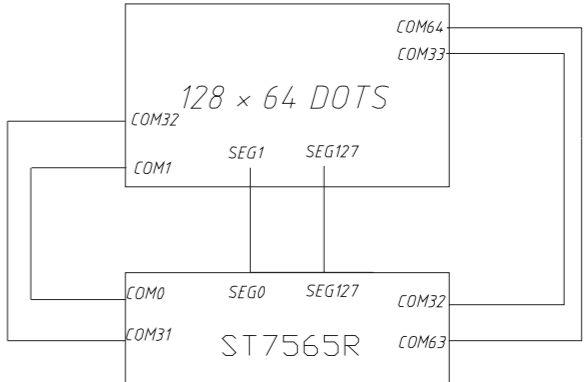
- 128 x 64 Pixels
- Built-in ST7565R controller
- 8080 MPU interfaces
- RoHS Compliant



SYMBOL	REVISION	DATE

**Pin Assignment**

NO.	SYMBOL
1	V0
2	V1
3	V2
4	V3
5	V4
6	C4+
7	C2-
8	C2+
9	C1+
10	C1-
11	C3+
12	VOUT
13	VDD
14	VSS
15	DB7
16	DB6
17	DB5
18	DB4
19	DB3
20	DB2
21	DB1
22	DB0
23	RD
24	WR
25	A0
26	RESETB
27	CS1B



- Notes:**
1. Driver: 1/65 Duty, 1/9 Bias
  2. Voltage: 3.0V VDD, 8.6V VLCD
  3. Optimal View: 6 o'clock
  4. Display Mode: FSTN Positive / Reflective
  5. Driver IC: ST7565R

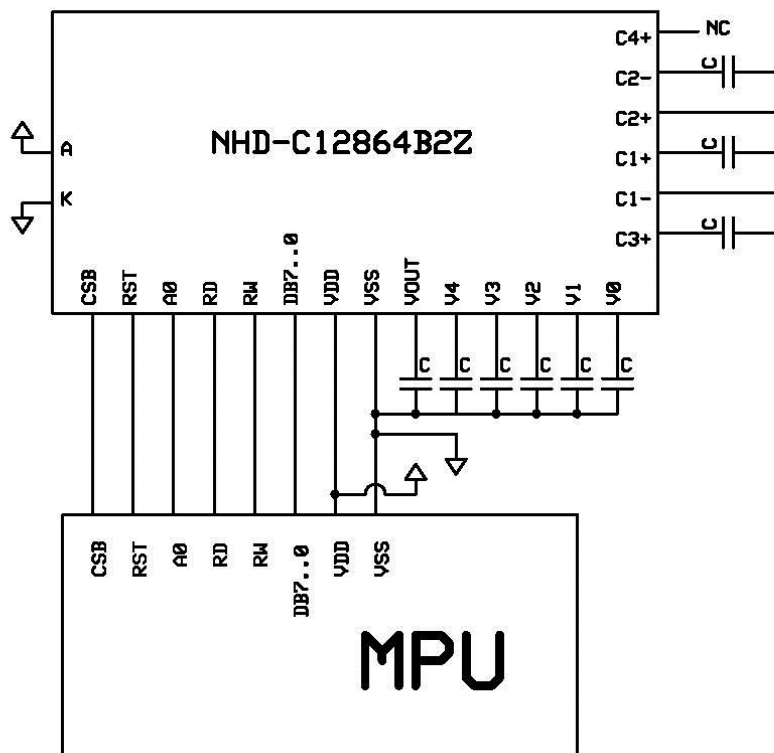
STANDARD TOLERANCES (UNLESS OTHERWISE SPECIFIED) LINEAR: XX. ±0.3 mm XX.X ±0.3 mm XX.XX ±0.3 mm				REVISION: 1.0
				DRAWING/PART NUMBER: NHD-C12864B2Z-RN-FBW
UNLESS OTHERWISE SPECIFIED - DIMENSIONS ARE IN MILLIMETERS - THIRD ANGLE PROJECTION	DRAWN BY: S. Baxi	CHECKED BY: S. Baxi	APPROVED BY: X. XXXXXX	SCALE: NS
	DRAWN DATE: 12/20/17	CHECKED DATE: 12/20/17	APPROVED DATE: xx/xx/xx	SHEET 1 OF 1
DO NOT SCALE DRAWING				
THIS DRAWING IS SOLELY THE PROPERTY OF NEWHAVEN DISPLAY INTERNATIONAL, INC. THE INFORMATION IT CONTAINS IS NOT TO BE DISCLOSED, REPRODUCED OR COPIED IN WHOLE OR PART WITHOUT WRITTEN APPROVAL FROM NEWHAVEN DISPLAY.				

## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V <sub>0</sub>	Power Supply	CAP to VSS (0.1~1Uf)
2	V <sub>1</sub>	Power supply	CAP to VSS (0.1~1Uf)
3	V <sub>2</sub>	Power Supply	CAP to VSS (0.1~1Uf)
4	V <sub>3</sub>	Power Supply	CAP to VSS (0.1~1Uf)
5	V <sub>4</sub>	Power Supply	CAP to VSS (0.1~1Uf)
6	C4+	Power Supply	No Connect
7	C2-	Power Supply	CAP to PIN8 (1~2.2uF)
8	C2+	Power Supply	CAP to PIN7 (1~2.2uF)
9	C1+	Power Supply	CAP to PIN10(1~2.2uF)
10	C1-	Power Supply	CAP to PIN9 (1~2.2uF)
11	C3+	Power Supply	CAP to PIN10 (1~2.2uF)
12	V <sub>OUT</sub>	Power Supply	CAP to VSS (1~2.2uF)
13	V <sub>DD</sub>	Power Supply	Power Supply for logic
14	V <sub>SS</sub>	Power Supply	Ground
15~22	DB7~DB0	MPU	This is an 8-bit-directional data bus.
23	/RD	MPU	Active low Read signal
24	/WR	MPU	Active low Write signal
25	A0	MPU	Register Select. 0: instruction; 1: data register
26	RESTB	MPU	Active low Reset signal. (May tie to VDD)
27	CS1B	MPU	Active low Chip Select. (May tie to VSS)

**Recommended LCD connector:** 27 pins, 0.5mm Pitch FFC

**Backlight connector:** --- **Mates with:** ---



## 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>	-	3.0	3.3	3.5	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> = 3.3V	TBD	0.3	0.75	mA
Supply for LCD (contrast)	V <sub>LCD</sub>	T <sub>OP</sub> = 25°C	8.3	8.6	8.9	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

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	CR ≥ 2	-	30	-	°
	Bottom		-	45	-	°
	Left		-	40	-	°
	Right		-	40	-	°
Contrast Ratio	CR	-	3	6	-	-
Response Time	Rise	T <sub>OP</sub> = 25°C	-	60	150	ms
	Fall		-	150	200	ms

## Controller Information

Built-in ST7565R Controller.

Please download specification at [http://www.newhavendisplay.com/app\\_notes/ST7565R.pdf](http://www.newhavendisplay.com/app_notes/ST7565R.pdf)

# Table of Commands

Table 16: Table of ST7565R Commands

(Note) \*: ignored data

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				0	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	0	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	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	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	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	0	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	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		0	0	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	0	0	Select internal resistor ratio(Rb/Ra) mode
(18) Electronic volume mode set	0	1	0	1	0	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					0	0	0	
(19) Sleep mode set	0	1	0	1	0	1	0	1	1	0	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	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	1	Command for non-operation
(22) Test	0	1	0	1	1	1	1	*	*	*	*	*	*	Command for IC test. Do not use this command

# Timing Characteristics

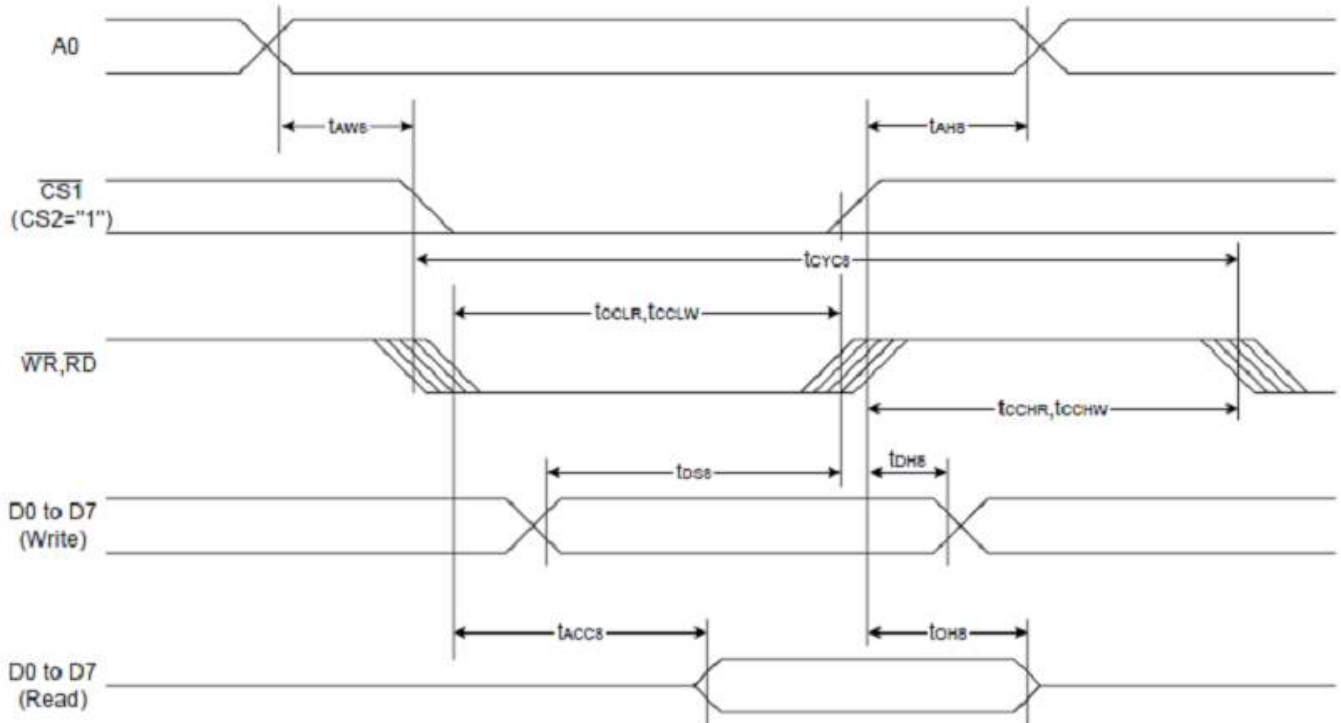
System bus read/write characteristics 1 (for the 8080 series MPU)

(Ta=25°C, VDD=3.0V)

Item	Signal	Symbol	condition	Min.	Max.	Unit
Address hold time	A0	tAH8		0	-	ns
Address setup time		tAW8		0	-	
Address cycle time		tCYC8		240	-	
Enable L pulse width(write)	WR	tCCLW		80	-	
Enable H pulse width(write)		tCCHW		80	-	
Enable L pulse width(read)	RD	tCCLR		140	-	
Enable H pulse width(read)		tCCHR		80	-	
Write data setup time	DB0~DB7	tDS8		40	-	
Write address hold time		tDH8		0	-	
Read access time		tACC8	CL=100Pf	-	70	
Read output disable time		tOH8	CL=100Pf	5	50	

Item	Signal	Symbol	Min.	Typ.	Max.	Unit
Reset time		tR	-	-	1.0	us
Reset 'L' pulse width	/RES	tRW	1.0	-	-	

System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)



# Example Initialization Program

```
'-----  
Sub Init  
Reset P3.7          'set Read/write to '0' for write  
Reset P3.0          'RS  
Set P3.1            'reset  
Reset P3.4 'E  
'Set P3.3  
'Reset P3.3  
Waitms 2  
'Set P3.3  
Waitms 20  
A = &HA2            '1/9 BIAS  
Call Writecom  
A = &HA0            'ADC SELECT , NORMAL  
Call Writecom  
A = &HC8            'COM OUTPUT REVERSE  
Call Writecom  
A = &HA4            'DISPLAY ALL POINTS NORMAL  
Call Writecom  
A = &H40            'DISPLAY START LINE SET  
Call Writecom  
A = &H25            'INTERNAL RESISTOR RATIO  
Call Writecom  
A = &H81            'ELECTRONIC VOLUME MODE SET  
Call Writecom  
A = &H10            'ELECTRONIC VOLUME  
Call Writecom  
A = &H2F            'POWER CONTROLLER SET  
Call Writecom  
A = &HAF            'DISPLAY ON  
Call Writecom  
End Sub
```

```
'-----  
Sub Writecom  
Reset P3.0          'A0 low  
Reset P3.7          'R/W low  
Set P3.6            'CS2  
Set P3.4            'E  
P1 = A  
Reset P3.4  
Reset P3.6  
Reset P3.7  
End Sub
```

```
Sub Writedata  
Set P3.0            'A0 high  
Reset P3.7          'R/W low  
Set P3.6            'CS2  
Set P3.4            'E  
P1 = A  
Reset P3.4  
Reset P3.6  
Reset P3.7  
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 , 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](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisplay.com/index.php?main\\_page=terms](http://www.newhavendisplay.com/index.php?main_page=terms)