NHD-C12864WC-FSW-FBW-3V3-M

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

NHD-	Newhaven Display
C12864-	128 x 64 Pixels
WM-	Model
F-	Transflective
SW-	Side White LED Backlight
F-	FSTN (+)
B-	6:00 Optimal View
W-	Wide Temp.
3V3-	3.0V LCD, 3.0V Backlight
M-	Mounting Holes
	RoHS Compliant

Newhaven Display International, Inc.

2661 Galvin Court

Elgin IL, 60124

Ph: 847-844-8795 Fax: 847-844-8796

www.newhavendisplay.com

nhtech@newhavendisplay.com nhsales@newhavendisplay.com

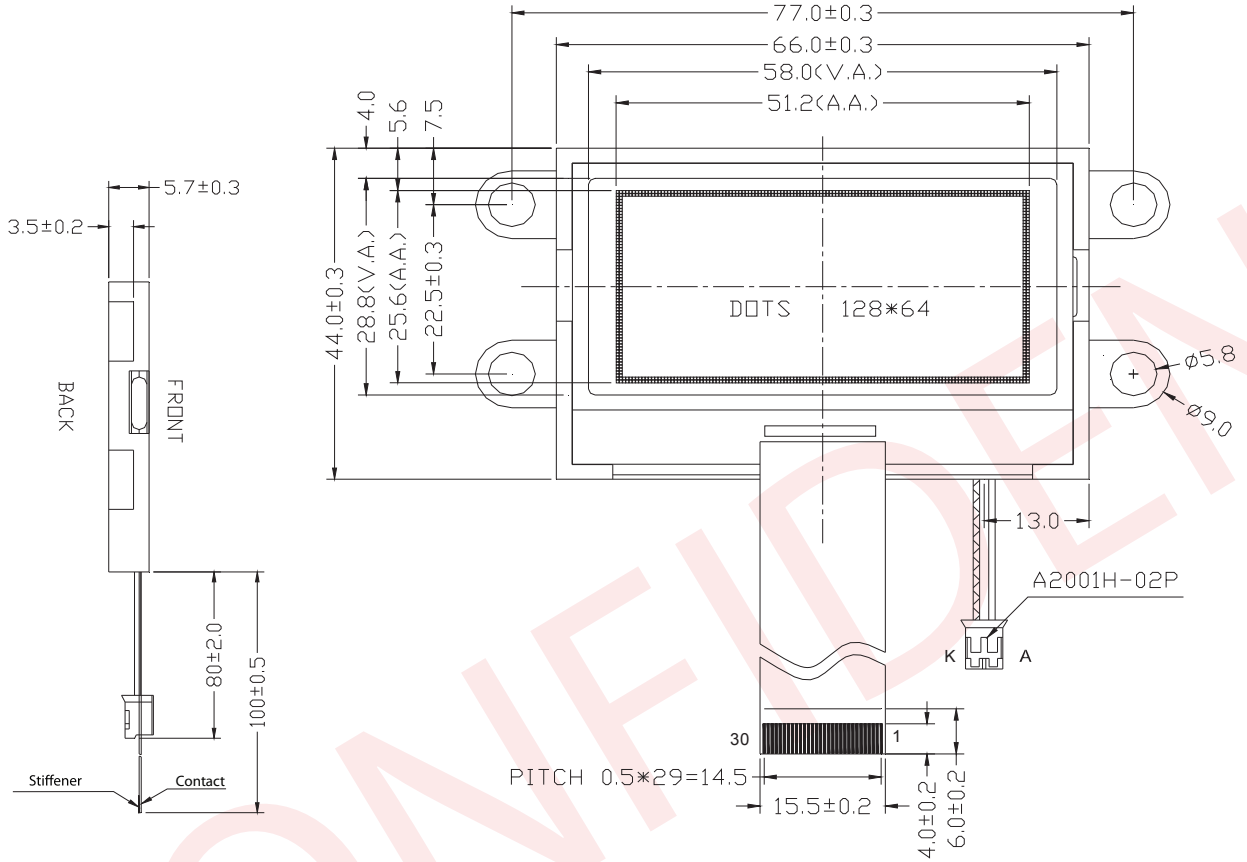
Document Revision History

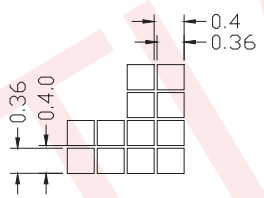
Revision	Date	Description	Changed by
0	10/12/2010	Initial Release	MC
1	5/25/2010	Electrical characteristics updated	AK
2	4/4/2013	Backlight mating connector part number updated	AK
3	3/16/2015	Pin Description updated	RM
4	9/30/2015	Wiring Diagram updated, Backlight Current rating added	SB

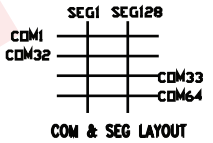
Functions and Features

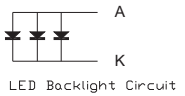
- **128 x 64 pixels**
- **Built-in ST7565R controller**
- **Parallel/Serial interface**
- **1/64 duty cycle; 1/9 bias**
- **RoHS Compliant**

Mechanical Drawing









PIN ASSIGNMENT

1	CS1B
2	/RES
3	A0
4	RW (/WR)
5	E (/RD)
6	DB0
7	DB1
8	DB2
9	DB3
10	DB4
11	DB5
12	DB6(SCL)
13	DB7(SI)
14	VSS
15	VOUT
16	C3+
17	C1-
18	C1+
19	C2+
20	C2-
21	VSS
22	VDD
23	V4
24	V3
25	V2
26	V1
27	V0
28	VR
29	C86
30	PS

Rev	Description	Date

Notes:

1). Driver Method: 1/64duty, 1/9bias, VDD3.0V VLCD10.3V
2). Display Type: FSTN/Positive/Transflective/6:00 Visual Angle
3). Operating Temp: -20 C~70 C/Storage Temp: -30 C~80 C
4). Backlight Type: Edge/White/Vled3.0V/36mA
5). Driver: ST7565R/Parallel or Serial MPU
6). RoHS Compliant

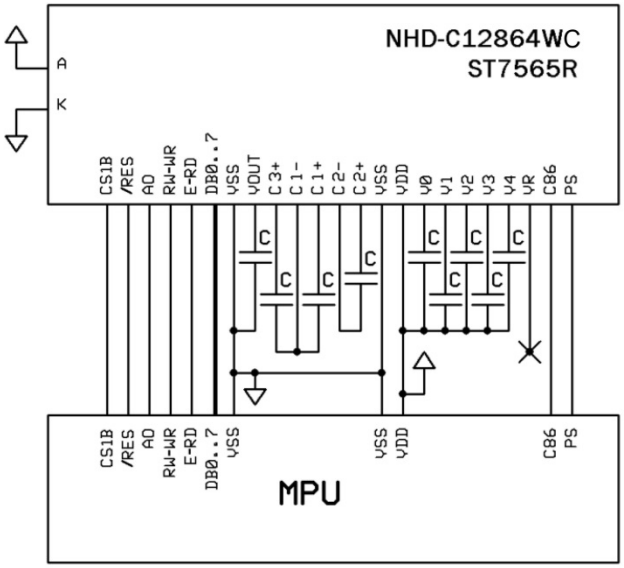
	Date	NEWHAVEN DISPLAY INTERNATIONAL
Gen. Tolerance ±0.3mm	Unit mm	Model: NHD-C12864WC-FSW-FBW-3V3-M

Pin Description and Wiring Diagram

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=0: Command, A0=1: Data
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	DB0	MPU	Parallel Interface DB0-DB7: Bi-directional 8-bit data bus Serial Interface: DB0-DB5: No connect in serial mode DB6 = Serial clock DB7 = Serial data
7	DB1	MPU	
8	DB2	MPU	
9	DB3	MPU	
10	DB4	MPU	
11	DB5	MPU	
12	DB6(SCL)	MPU	
13	DB7(SI)	MPU	
14	VSS	Power Supply	Ground (reference for voltage step-up circuit)
15	VOUT	Power Supply	Connect to 1uF cap to VSS (PIN-14)
16	CAP3+	Power Supply	Connect to 1uF cap to CAP1- (PIN-17)
17	CAP1-	Power Supply	Connect to 1uF cap to CAP3+(PIN16) and CAP1+(PIN18)
18	CAP1+	Power Supply	Connect to 1uF cap to CAP1- (PIN-17)
19	CAP2+	Power Supply	Connect to 1uF cap to CAP2- (PIN-20)
20	CAP2-	Power Supply	Connect to 1uF cap to CAP2+ (PIN-19)
21	VSS	Power Supply	Ground
22	VDD	Power Supply	Supply voltage for LCD and logic (3.0V)
23~27	V4~V0	Power Supply	1.0uF-2.2uF cap to VDD or VSS
28	VR	-	No Connect
29	C86	MPU	Select MPU interface pin. C86=H: 6800; C86=L: 8080
30	PS	MPU	Parallel/Serial Select. PS= H: Parallel; PS=L: Serial
A		Power Supply	Backlight Anode (+3.0V)
K		Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 0.5mm Pitch, 30 pin FFC. Molex p/n: 52892-3095
Backlight connector: A2001H-2P **Mates with**: A2001WR-2P, A2001WR-S-2P, A2001WV-2P, A2001WV-S-2P

Wiring Diagram



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		2.7	3.0	3.3	V
Supply Current	IDD	VDD=3.0V	-	-	0.5	mA
Supply for LCD (contrast)	VDD-V0	-	-	10.3	-	V
"H" Level input	Vih		0.8*VDD	-	VDD	V
"L" Level input	Vil		VSS	-	0.2*VDD	V
"H" Level output			0.8*VDD	-	VDD	-
"L" Level output			-	-	0.2*VDD	-
LED BKL voltage	VLED	-	-	3.0	-	V
LED BKL current	ILED	VLED=3.0	-	36	50	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle – Top		CR ≥ 2	-	20	-	°
Viewing Angle – Bottom			-	50	-	°
Viewing Angle – Left			-	30	-	°
Viewing Angle – Right			-	30	-	°
Contrast Ratio	CR		3	5	-	-
Response Time (rise)	Tr		-	150	250	ms
Response Time (fall)	Tf		-	150	250	ms

Controller Information

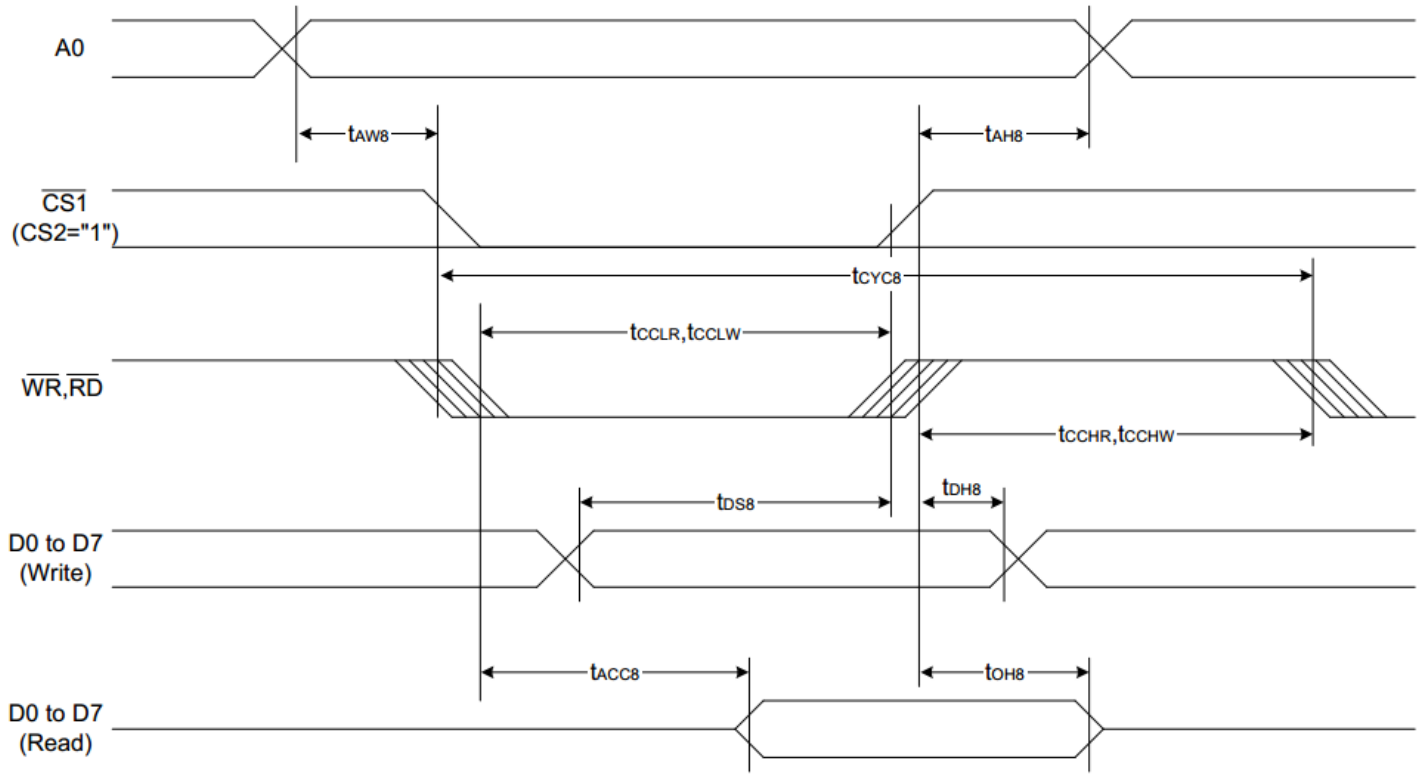
Built-in ST7565R controller.
Please download specification at http://www.newhavendisplay.com/app_notes/ST7565R.pdf

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 Column address set lower 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.
				0	0	0	0	Least significant 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 (ST7565R)
(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) V_0 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 Electronic volume register set	0	1	0	1	0	0	0	0	0	0	1	Set the V_0 output voltage electronic volume register
				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
				*	*	*	*	*	*	0	0	
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
				0	0	0	0	0	0	step-up value		
(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

Timing Characteristics

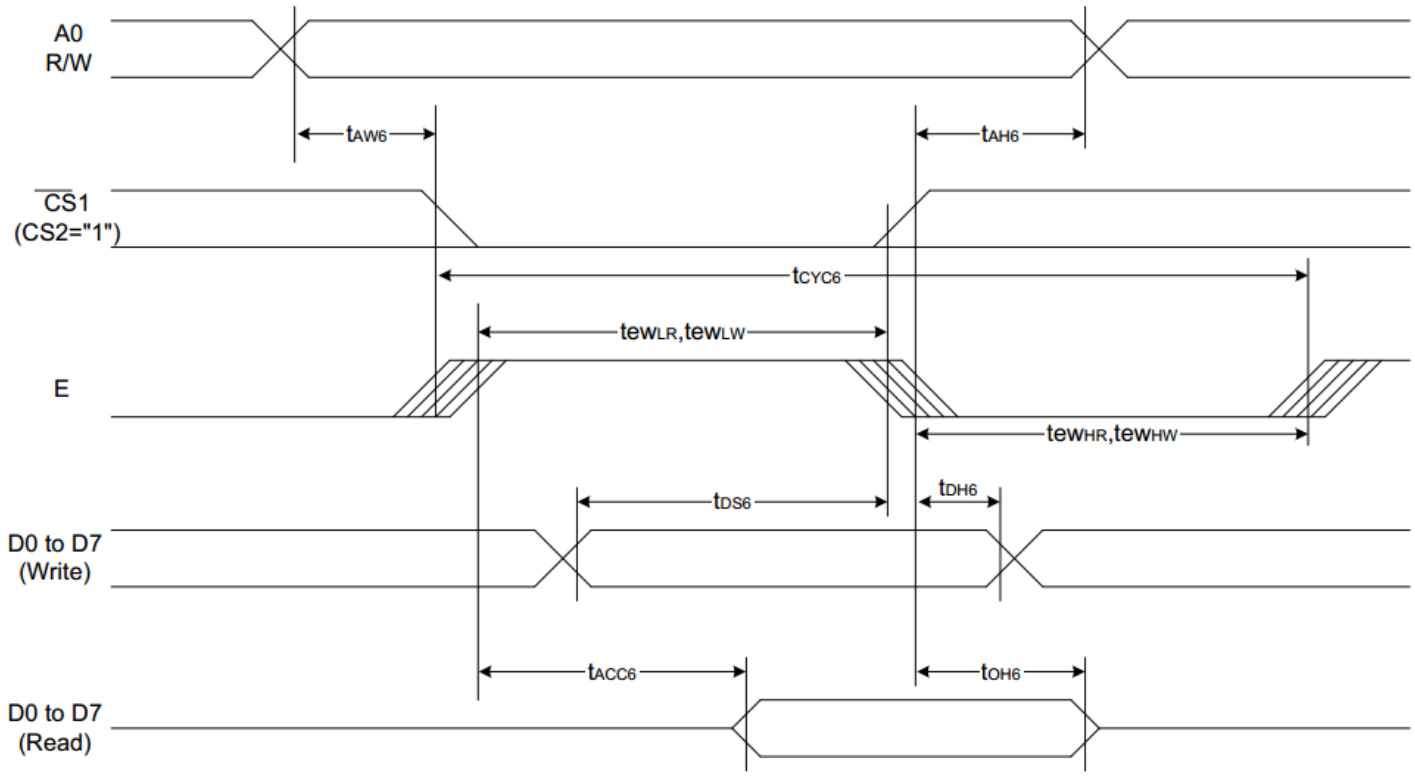
System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)



(VDD = 3.3V, Ta = –30 to 85℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH8		0	—	Ns
Address setup time		tAW8		0	—	
System 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	D0 to D7	tDS8		40	—	
WRITE Address hold time		tDH8		0	—	
READ access time		tACC8	CL = 100 pF	—	70	
READ Output disable time		tOH8	CL = 100 pF	5	50	

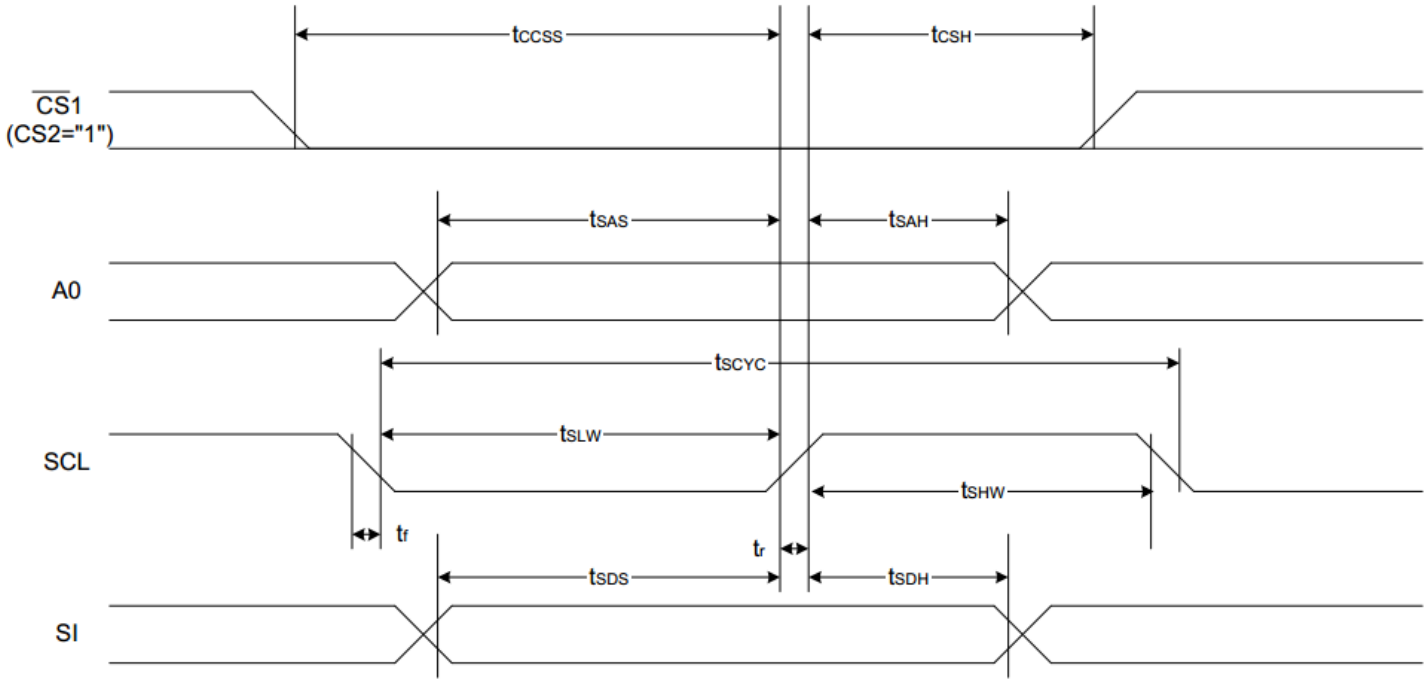
System Bus Read/Write Characteristics 2 (For the 6800 Series MPU)



(VDD = 3.3V,Ta = –30 to 85℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6		0	—	ns
Address setup time		tAW6		0	—	
System cycle time		tCYC6		240	—	
Enable L pulse width (WRITE)	WR	tEWLW		80	—	
Enable H pulse width (WRITE)		tEWHW		80	—	
Enable L pulse width (READ)	RD	tEWLR		80	—	
Enable H pulse width (READ)		tEWHR		140		
WRITE Data setup time	D0 to D7	tDS6		40	—	
WRITE Address hold time		tDH6		0	—	
READ access time		tACC6	CL = 100 pF	—	70	
READ Output disable time		tOH6	CL = 100 pF	5	50	

The 4-line SPI Interface



(VDD = 3.3V,Ta = –30 to 85℃)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
4-line SPI Clock Period	SCL	Tscyc		50	—	ns
SCL “H” pulse width		Tshw		25	—	
SCL “L” pulse width		TSLW		25	—	
Address setup time	A0	TSAS		20	—	
Address hold time		Tsah		10	—	
Data setup time	SI	Tsds		20	—	
Data hold time		TSDH		10	—	
CS-SCL time	CS	Tcss		20	—	
CS-SCL time		Tcsh		40	—	

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

Warranty Information and Terms & Conditions

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