# NHD-320240WG-BxTFH-VZ#

## Graphic Liquid Crystal Display Module

| | |
|---|---|
| NHD- | Newhaven Display |
| 320240- | 320 x 240 Pixels |
| WG- | Display Type: Graphic |
| Bx- | Model |
| T- | White LED Backlight |
| F- | FSTN (+) |
| H- | Transflective, 6:00 Optimal View, Wide Temperature |
| VZ- | Built-in Negative Voltage |
| #- | **RoHS Compliant** |


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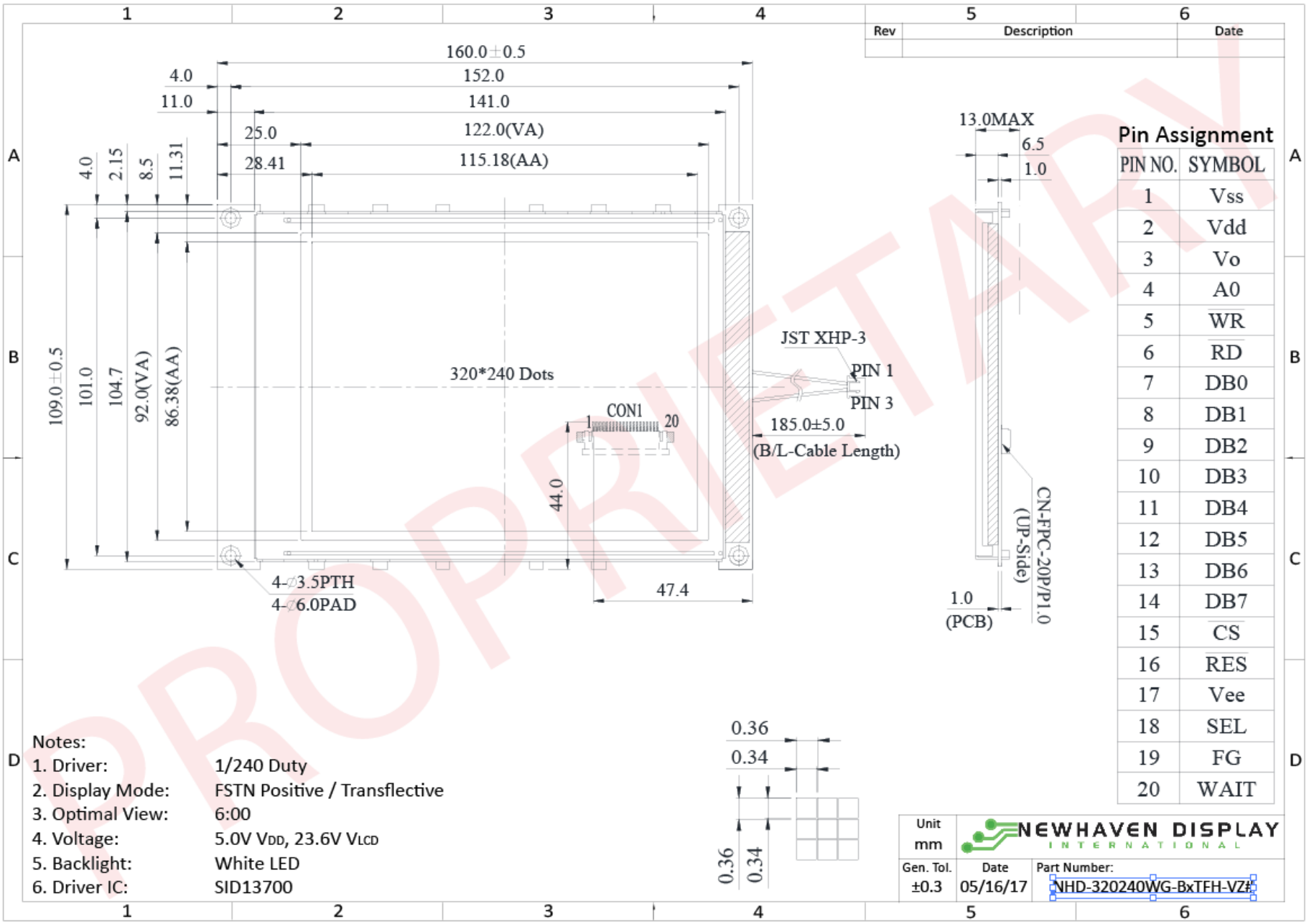
## Document Revision History

| Revision | Date | Description | Changed by |
|---|---|---|---|
| 0 | 6/7/07 | Initial Release | - |
| 1 | 4/20/10 | User guide reformat | MC |
| 2 | 9/22/11 | Electrical characteristics updated | AK |
| 3 | 10/7/13 | Mechanical Drawing, Pin Description, Wiring Diagram, and Timing Characteristics updated | ML |
| 4 | 6/1/16 | Electrical characteristics, Pin description, Quality Info updated | TM |
| 5 | 8/3/16 | Electrical and Optical characteristics updated | TM |
| 6 | 5/16/17 | Mechanical & Electrical Characteristics Updated | SB |

## Functions and Features

- 320 x 240 pixels
- +5.0V or +3.3V power supply
- Built-in S1D13700 Controller
- Default 8080 mode
- 8-bit Parallel interface

## Mechanical Drawing




### Pin Assignment

| PIN NO. | SYMBOL |
|---|---|
| 1 | Vss |
| 2 | Vdd |
| 3 | Vo |
| 4 | A0 |
| 5 | $\overline{WR}$ |
| 6 | $\overline{RD}$ |
| 7 | DB0 |
| 8 | DB1 |
| 9 | DB2 |
| 10 | DB3 |
| 11 | DB4 |
| 12 | DB5 |
| 13 | DB6 |
| 14 | DB7 |
| 15 | $\overline{CS}$ |
| 16 | $\overline{RES}$ |
| 17 | Vee |
| 18 | SEL |
| 19 | FG |
| 20 | WAIT |

Notes:

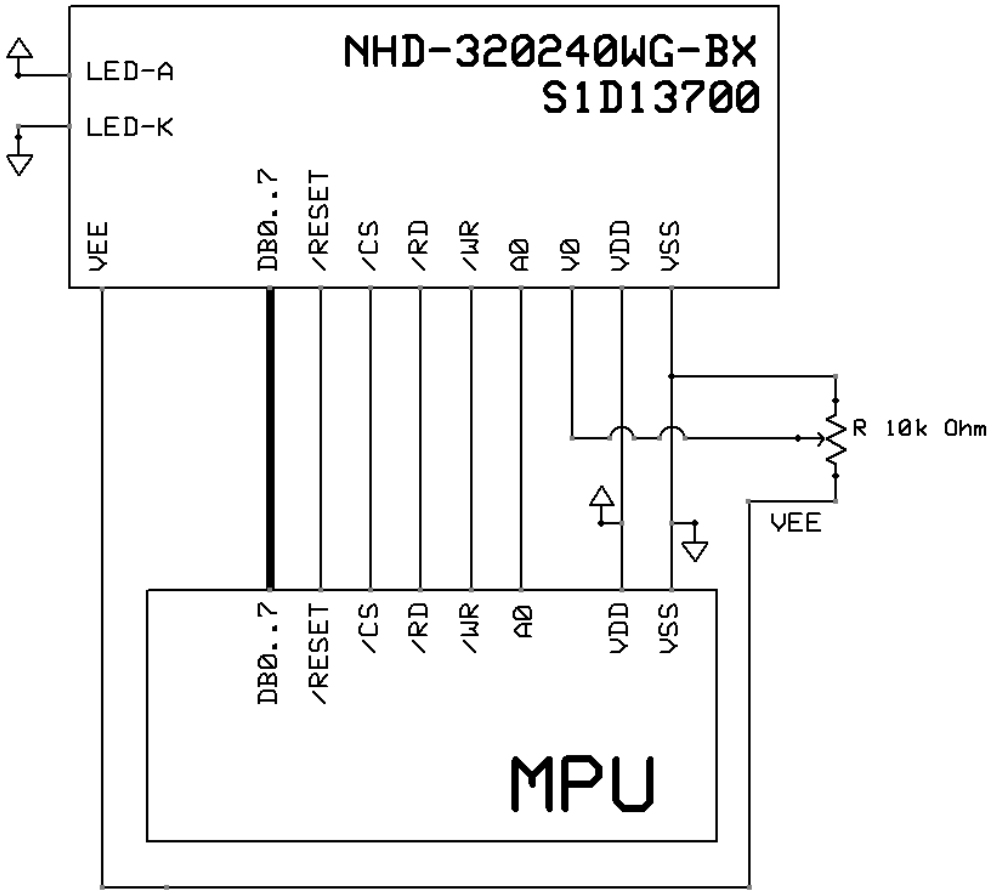
| | |
|---|---|
| 1. Driver: | 1/240 Duty |
| 2. Display Mode: | FSTN Positive / Transflective |
| 3. Optimal View: | 6:00 |
| 4. Voltage: | 5.0V $V_{DD}$, 23.6V $V_{LCD}$ |
| 5. Backlight: | White LED |
| 6. Driver IC: | SID13700 |

| Unit | | |
|---|---|---|
| mm | NEWHAVEN DISPLAY INTERNATIONAL | |
| Gen. Tol. | Date | Part Number: |
| ±0.3 | 05/16/17 | NHD-320240WG-BxTFH-VZ# |

## Pin Description and Wiring Diagram

| Pin No. | Symbol | External Connection | Function Description |
|---|---|---|---|
| 1 | $V_{SS}$ | Power Supply | Ground |
| 2 | $V_{DD}$ | Power Supply | Supply Voltage (+5.0V) |
| 3 | $V_0$ | Adj. Power Supply | Supply Voltage for Contrast (approx. -18.8V) |
| 4 | A0 | MPU | Register Select signal. A0=1: Command, A0=0: Data |
| 5 | /WR<br>R/W | MPU | 8080: Active LOW Write signal<br>6800: Read/Write select signal, R/W=1: Read R/W=0: Write |
| 6 | /RD<br>E | MPU | 8080: Active LOW Read signal<br>6800: Operation Enable signal. Falling edge triggered. |
| 7-14 | DB0-DB7 | MPU | 8-bit bi-directional data bus |
| 15 | /CS | MPU | Active LOW Chip Select signal |
| 16 | /RESET | MPU | Active LOW Reset signal |
| 17 | $V_{EE}$ | Power Supply | Negative voltage output (-25V) |
| 18 | NC | - | No Connect |
| 19 | NC | - | No Connect |
| 20 | NC | - | No Connect |
| A | LED+ | Power Supply | Backlight Anode (130mA @ 3.5V) |
| K | LED- | Power Supply | Backlight Cathode (Ground) |

**Recommended LCD connector:** 1.0mm pitch, 20-pos FFC connector
**Backlight connector:** JST p/n: XHP-3 **Mates with**: JST p/n: B 3B-XH-A



## Electrical Characteristics

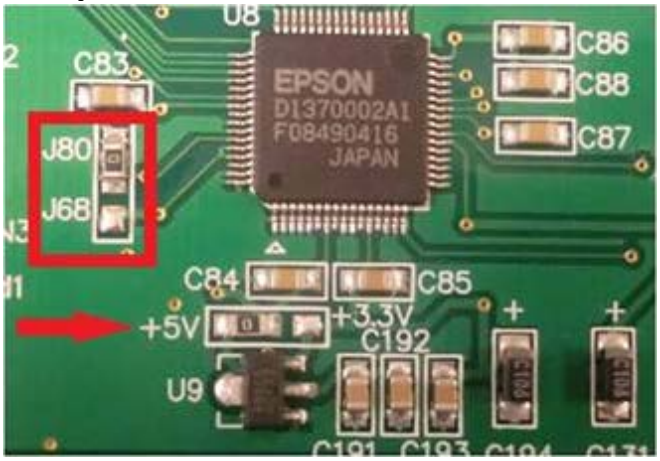
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Operating Temperature Range | $T_{OP}$ | Absolute Max | -20 | - | +70 | °C |
| Storage Temperature Range | $T_{ST}$ | Absolute Max | -30 | - | +80 | °C |
| Supply Voltage | $V_{DD}$ | - | 3.3 | 5.0 | 5.5 | V |
| Supply Current | $I_{DD}$ | $V_{DD}$=5.0V | 35 | 65 | 110 | mA |
| Supply for LCD (contrast) | $V_{LCD}$ | $T_{OP}$ =25°C | 23.0 | 23.6 | 24.2 | V |
| "H" Level input | $V_{IH}$ | $V_{DD}$ = 5.0V | 3.5 | - | $V_{DD}$ | V |
| | | $V_{DD}$ = 3.3V | 2.0 | - | $V_{DD}$ | V |
| "L" Level input | $V_{IL}$ | $V_{DD}$ = 5.0V | $V_{SS}$ | - | 1.0 | V |
| | | $V_{DD}$ = 3.3V | $V_{SS}$ | - | 0.8 | V |
| "H" Level output | $V_{OH}$ | $V_{DD}$ = 5.0V | $V_{DD}$-0.4 | - | $V_{DD}$ | V |
| | | $V_{DD}$ = 3.3V | $V_{DD}$-0.4 | - | $V_{DD}$ | V |
| "L" Level output | $V_{OL}$ | $V_{DD}$ = 5.0V | $V_{SS}$ | - | 0.4 | V |
| | | $V_{DD}$ = 3.3V | $V_{SS}$ | - | 0.4 | V |
| | | | | | | |
| Backlight Supply Current | $I_{LED}$ | - | - | 130 | 160 | mA |
| Backlight Supply Voltage | $V_{LED}$ | $I_{LED}$ = 130mA | 3.3 | 3.5 | 3.7 | V |

*The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

## Optical Characteristics

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Optimal Viewing Angles | Top | φY+ | Cr ≥ 2 | - | 30 | - | ° |
| | Bottom | φY- | | - | 60 | - | ° |
| | Left | θX- | | - | 45 | - | ° |
| | Right | θX+ | | - | 45 | - | ° |
| Contrast Ratio | | Cr | - | - | 5 | - | - |
| Response Time | Rise | Tr | $T_{OP}$ = 25²C | - | 200 | 300 | ms |
| | Fall | Tf | | - | 250 | 350 | ms |

## Jumper Selection




**Note: This display is pre-configured for 5V and 8080 mode.**

## Controller Information

Built-in S1D13700 controller.
Please download specification at http://www.newhavendisplay.com/app_notes/S1D13700.pdf

# Table of Commands

**REG[01h] Horizontal Character Size Register**
Address = 8001h Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| MOD | n/a | | | Horizontal Character Size bits 3-0 | | | |

**REG[02h] Vertical Character Size Register**
Address = 8002h Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| n/a | | | | Vertical Character Size bits 3-0 | | | |

**REG[03h] Character Bytes Per Row Register**
Address = 8003h Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| Character Bytes Per Row bits 7-0 | | | | | | | |

**REG[04h] Total Character Bytes Per Row Register**
Address = 8004h Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| Total Character Bytes Per Row bits 7-0 | | | | | | | |

**REG[05h] Frame Height Register**
Address = 8005h Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| Frame Height bits 7-0 | | | | | | | |

**REG[06h] Horizontal Address Range Register 0**
Address = 8006h Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| Horizontal Address Range bits 7-0 | | | | | | | |

**REG[07h] Horizontal Address Range Register 1**
Address = 8007h Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| Horizontal Address Range bits 15-8 | | | | | | | |

**REG[08h] Power Save Mode Register**
Address = 8008h Default = 01h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| n/a | | | | | | | Power Save Mode Enable |

**REG[09h] Display Enable Register**
Address = 8009h Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| n/a | | | | | | | Display Enable |

**REG[0Ah] Display Attribute Register**
Address = 800Ah Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| SAD3 Attribute bits 1-0 | | SAD2 Attribute bits 1-0 | | SAD1 Attribute bits 1-0 | | Cursor Attribute bits 1-0 | |

**REG[0Bh] Screen Block 1 Start Address Register 0**
Address = 800Bh Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| Screen Block 1 Start Address bits 7-0 (LSB) | | | | | | | |

**REG[0Ch] Screen Block 1 Start Address Register 1**
Address = 800Ch Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| Screen Block 1 Start Address bits 15-8 (MSB) | | | | | | | |

**REG[0Dh] Screen Block 1 Size Register**
Address = 800Dh Default = 00h Read/Write

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|
| Screen Block 1 Size bits 7-0 | | | | | | | |

**REG[0Eh] Screen Block 2 Start Address Register 0**

Address = 800Eh Default = 00h Read/Write

| Screen Block 2 Start Address bits 7-0 (LSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[0Fh] Screen Block 2 Start Address Register 1**

Address = 800Fh Default = 00h Read/Write

| Screen Block 2 Start Address bits 15-8 (MSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[10h] Screen Block 2 Size Register**

Address = 8010h Default = 00h Read/Write

| Screen Block 2 Size bits 7-0 | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[11h] Screen Block 3 Start Address Register 0**

Address = 8011h Default = 00h Read/Write

| Screen Block 3 Start Address bits 7-0 (LSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[12h] Screen Block 3 Start Address Register 1**

Address = 8012h Default = 00h Read/Write

| Screen Block 3 Start Address bits 15-8 (MSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[13h] Screen Block 4 Start Address Register 0**

Address = 8013h Default = 00h Read/Write

| Screen Block 4 Start Address bits 7-0 (LSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[14h] Screen Block 4 Start Address Register 1**

Address = 8014h Default = 00h Read/Write

| Screen Block 4 Start Address bits 15-8 (MSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[15h] Cursor Width Register**

Address = 8015h Default = 00h Read/Write

| n/a | | | | Cursor Width bits 3-0 | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[16h] Cursor Height Register**

Address = 8016h Default = 00h Read/Write

| Cursor Mode | n/a | | | Cursor Height bits 3-0 | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[17h] Cursor Shift Direction Register**

Address = 8017h Default = 00h Read/Write

| n/a | | | | | | Cursor Shift Direction bits 1-0 | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[18h] Overlay Register**

Address = 8018h Default = 00h Read/Write

| n/a | | | 3 Layer Overlay Select | Screen Block 3 Display Mode | Screen Block 1 Display Mode | Layer Composition Method bits 1-0 | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[19h] Character Generator RAM Start Address Register 0**

Address = 8019h Default = 00h Read/Write

| CGRAM Start Address bits 7-0 (LSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[1Ah] Character Generator RAM Start Address Register 1**

Address = 801Ah Default = 00h Read/Write

| CGRAM Start Address bits 15-8 (MSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[1Bh] Horizontal Pixel Scroll Register**

Address = 801Bh Default = 00h Read/Write

| n/a | | | | | Horizontal Pixel Scroll bits 2-0 | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[1Ch] Cursor Write Register 0**

Address = 801Ch  Default = 00h  Write Only

| Cursor Write bits 7-0 (LSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[1Dh] Cursor Write Register 1**

Address = 801Dh  Default = 00h  Write Only

| Cursor Write bits 15-8 (MSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[1Eh] Cursor Read Register 0**

Address = 801Eh  Default = 00h  Read Only

| Cursor Read bits 7-0 (LSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

**REG[1Fh] Cursor Read Register 1**

Address = 801Fh  Default = 00h  Read Only

| Cursor Read bits 15-8 (MSB) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

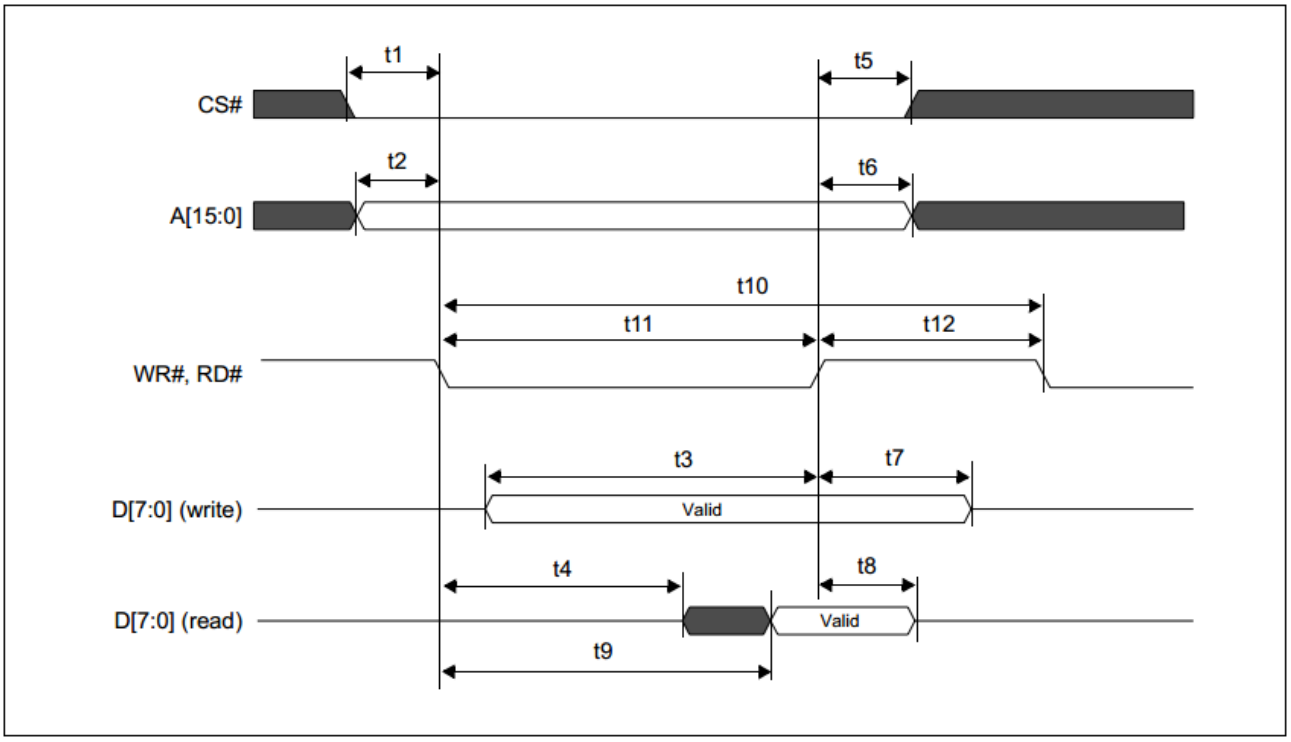
**REG[20h] Bit-Per-Pixel Select Register**

Address = 8020h  Default = 00h  Read/Write

| n/a | | | | | | Bit-Per-Pixel Select bits 1-0 | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

# Timing Characteristics

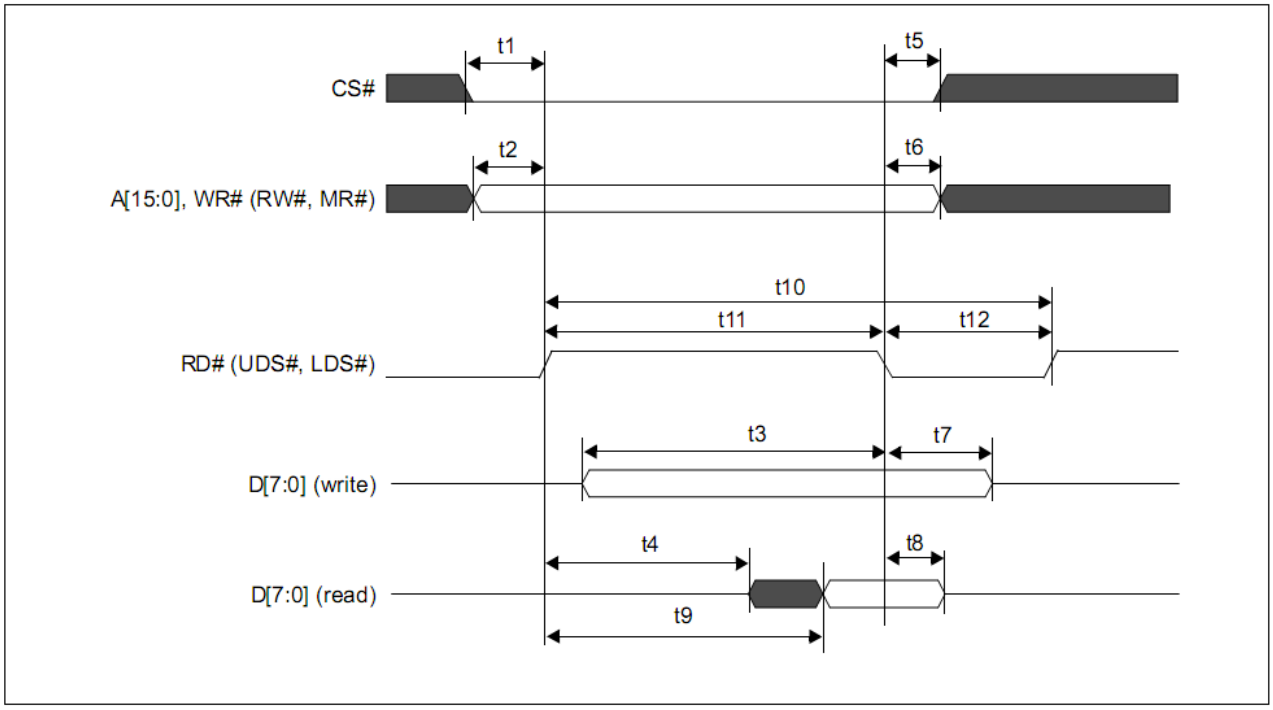
## 8080 Family Bus Interface Timing




| Symbol | Parameter | 3.3 Volt | | 5.0 Volt | | Units |
|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | |
| t1 | CS# setup time | 5 | — | 5 | — | ns |
| t2 | A[15:0] setup time | 5 | — | 5 | — | ns |
| t3 | D[7:0] setup time to WR# rising edge (write cycle) | Note 2 | — | Note 2 | — | ns |
| t4 | RD# falling edge to D[7:0] driven (read cycle) | 3 | — | 3 | — | ns |
| t5 | CS# hold time | 7 | — | 7 | — | ns |
| t6 | A[15:0] hold time | 7 | — | 7 | — | ns |
| t7 | D[7:0] hold time from WR# rising edge (write cycle) | 5 | — | 5 | — | ns |
| t8 | D[7:0] hold time from RD# rising edge (read cycle) | 3 | 14 | 3 | 14 | ns |
| t9 | RD# falling edge to valid Data (read cycle) | — | Note 3 | — | Note 3 | ns |
| t10 | RD#, WR# cycle time | Note 4 | — | Note 4 | — | ns |
| t11 | RD#, WR# pulse active time | 5 | — | 5 | — | Ts |
| t12 | RD#, WR# pulse inactive time | Note 5 | — | Note 5 | — | ns |

1. Ts = System clock period
2. t3min = 2Ts + 5
3. t9max = 4Ts + 18 (for 3.3V)
   = 4Ts + 20 (for 5.0V)
4. t10min = 6Ts (for a read cycle followed by a read or write cycle)
   = 7Ts + 2 (for a write cycle followed by a write cycle)
   = 10Ts + 2 (for a write cycle followed by a read cycle)
5. t12min = 1Ts (for a read cycle followed by a read or write cycle)
   = 2Ts + 2 (for a write cycle followed by a write cycle)
   = 5Ts + 2 (for a write cycle followed by a read cycle)

## 6800 Family Bus Interface Timing




| Symbol | Parameter | 3.3 Volt | | 5.0 Volt | | Units |
|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | |
| t1 | CS# setup time | 5 | — | 5 | — | ns |
| t2 | A[15:0] setup time | 5 | — | 5 | — | ns |
| t3 | D[7:0] setup time to RD# falling edge (write cycle) | Note 2 | — | Note 2 | — | ns |
| t4 | RD# rising edge to D[7:0] driven (read cycle) | 3 | — | 3 | — | ns |
| t5 | CS# hold time | 7 | — | 7 | — | ns |
| t6 | A[15:0] hold time | 7 | — | 7 | — | ns |
| t7 | D[7:0] hold time from RD# falling edge (write cycle) | 5 | — | 5 | — | ns |
| t8 | D[7:0] hold time from RD# falling edge (read cycle) | 2 | 55 | 2 | 55 | ns |
| t9 | RD# rising edge to valid Data | — | Note 3 | — | Note 3 | ns |
| t10 | RD# cycle time | Note 4 | — | Note 4 | — | ns |
| t11 | RD# pulse active time | 5 | — | 5 | — | Ts |
| t12 | RD# pulse inactive time | Note 5 | — | Note 5 | — | ns |

1. Ts = System clock period
2. t3min = 2Ts + 5
3. t9max = 4Ts + 18 (for 3.3V)
   = 4Ts + 20 (for 5.0V)
4. t10min = 6Ts (for a read cycle followed by a read or write cycle)
   = 7Ts + 2 (for a write cycle followed by a write cycle)
   = 10Ts + 2 (for a write cycle followed by a read cycle)
5. t12min = 1Ts (for a read cycle followed by a read or write cycle)
   = 2Ts + 2 (for a write cycle followed by a write cycle)
   = 5Ts + 2 (for a write cycle followed by a read cycle)

## Example Initialization Code

```
//-------------------------------------------------------------------------------

Sub Writecom
 Set P3.0                                                    'A0 = H = Write command
 P1 = A                                                      'move data to P1
 Reset P3.1                                                  'chip select
 Reset P3.7                                                  'R/W
 Set P3.4                                                    'E
 Reset P3.4                                                  'E
 Set P3.7                                                    'R/W
 Set P3.1                                                    'CS
End Sub


Sub Writedata
 Reset P3.0                                                  'A0 = L = Write data
 P1 = A
 Reset P3.1
 Reset P3.7
 Set P3.4
 Reset P3.4
 Set P3.7
 Set P3.1
End Sub

//-------------------------------------------------------------------------------

Sub Init
 Reset P3.6                                                  'RESET
 Waitms 10                                                   'wait
 Set P3.6                                                    'RESET done
 Waitms 100                                                  'wait

 A = &H40                                                    'system set command
 Call Writecom
 A = &H30                                                    'set parameters
 Call Writedata
 A = &H87                                                    'horizontal character size=8
 Call Writedata
 A = &H07                                                    'vertical character size=8
 Call Writedata
 A = &H27                                                    'display addresses per line
 Call Writedata
 A = &H50                                                    'total address range per line
 Call Writedata
 A = &HEF                                                    '240 display lines
 Call Writedata
 A = &H28                                                    'virtual address1
 Call Writedata
 A = &H00                                                    'virtual address2
 Call Writedata
 A = &H44                                                    'scroll
 Call Writecom
 A = &H00                                                    'start address1
 Call Writedata
 A = &H00                                                    'start address2
 Call Writedata
 A = &HEF                                                    '240 lines
 Call Writedata
 A = &HB0                                                    '2nd screen start1
 Call Writedata
 A = &H04                                                    '2nd screen start2
 Call Writedata
 A = &HEF                                                    '2nd screen 240 lines
```

```
 Call Writedata
 A = &H00                                                    '3rd screen address1
 Call Writedata
 A = &H00                                                    '3rd screen address2
 Call Writedata
 A = &H00                                                    '4th screen address1
 Call Writedata
 A = &H00                                                    '4th screen address2
 Call Writedata
 A = &H5A                                                    'hdot scr
 Call Writecom
 A = &H00                                                    'horizontal pixel shift=0
 Call Writedata
 A = &H5B                                                    'overlay
 Call Writecom
 A = &H00                                                    'OR
 Call Writedata
 A = &H5D                                                    'cursor form
 Call Writecom
 A = &H04                                                    '5 pixels
 Call Writedata
 A = &H86                                                    'by 7 pixels
 Call Writedata
 A = &H4C                                                    'cursor direction = right
 Call Writecom


 Call Clr                                                    'clear the screen


 A = &H59                                                    'disp on/off
 Call Writecom
 A = &H14                                                    'on
 Call Writedata
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 , 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, 5min -> 70°C, 30min = 1 cycle<br>10 cycles | |
| Vibration test | Endurance test applying vibration to simulate transportation and use. | 10-55Hz, 15mm amplitude.<br>60 sec in each of 3 directions X,Y,Z<br>For 15 minutes | 3 |
| Static electricity test | Endurance test applying electric static discharge. | VS=800V, RS=330Ω, CS=150pF<br>10 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

See Terms & Conditions at http://www.newhavendisplay.com/index.php?main_page=terms