



**THE DATASHEET OF  
NHD-C12864B2Z-RN-FBW**



**Product Specification**

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# NHD-C12864B2Z-RN-FBW

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

|                |                   |
|----------------|-------------------|
| <b>NHD-</b>    | Newhaven Display  |
| <b>C12864-</b> | 128 x 64 Pixels   |
| <b>B2Z-</b>    | Model             |
| <b>R-</b>      | Reflective        |
| <b>N-</b>      | No Backlight      |
| <b>F-</b>      | FSTN (+)          |
| <b>B-</b>      | 6:00 Optimal View |
| <b>W-</b>      | Wide Temperature  |

## Table of Contents

|                                     |   |
|-------------------------------------|---|
| Document Revision History.....      | 2 |
| Mechanical Drawing.....             | 3 |
| Pin Description.....                | 4 |
| Wiring Diagram.....                 | 4 |
| Electrical Characteristics.....     | 5 |
| Optical Characteristics.....        | 5 |
| Controller Information.....         | 5 |
| Table of Commands.....              | 6 |
| Timing Characteristics.....         | 7 |
| Example Initialization Program..... | 8 |
| Quality Information.....            | 9 |

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## Additional Resources

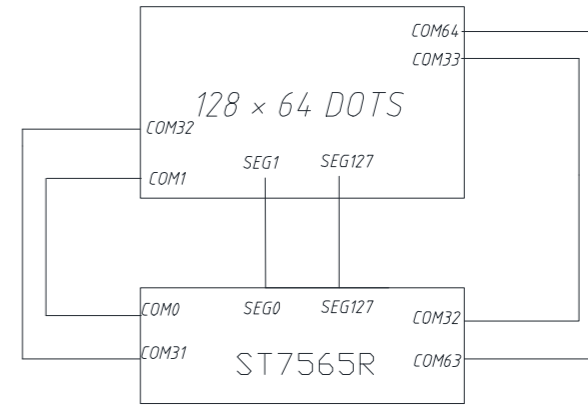
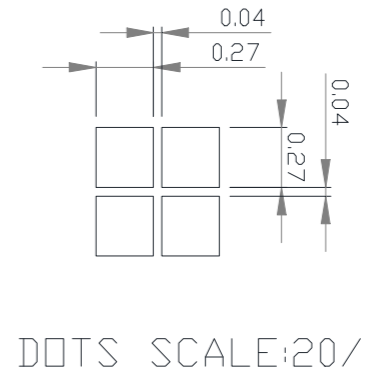
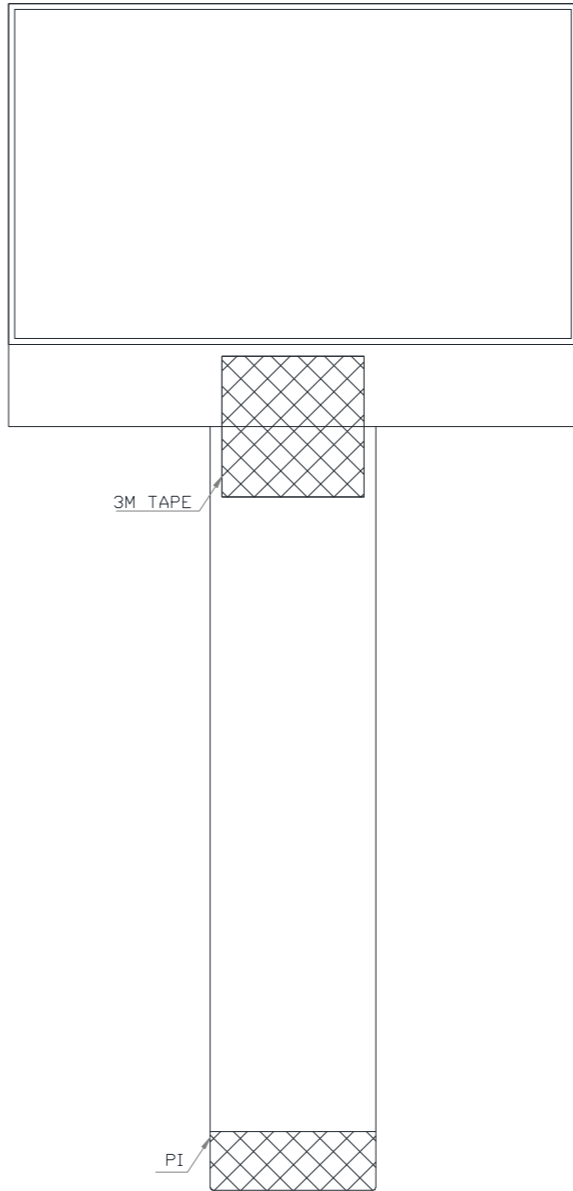
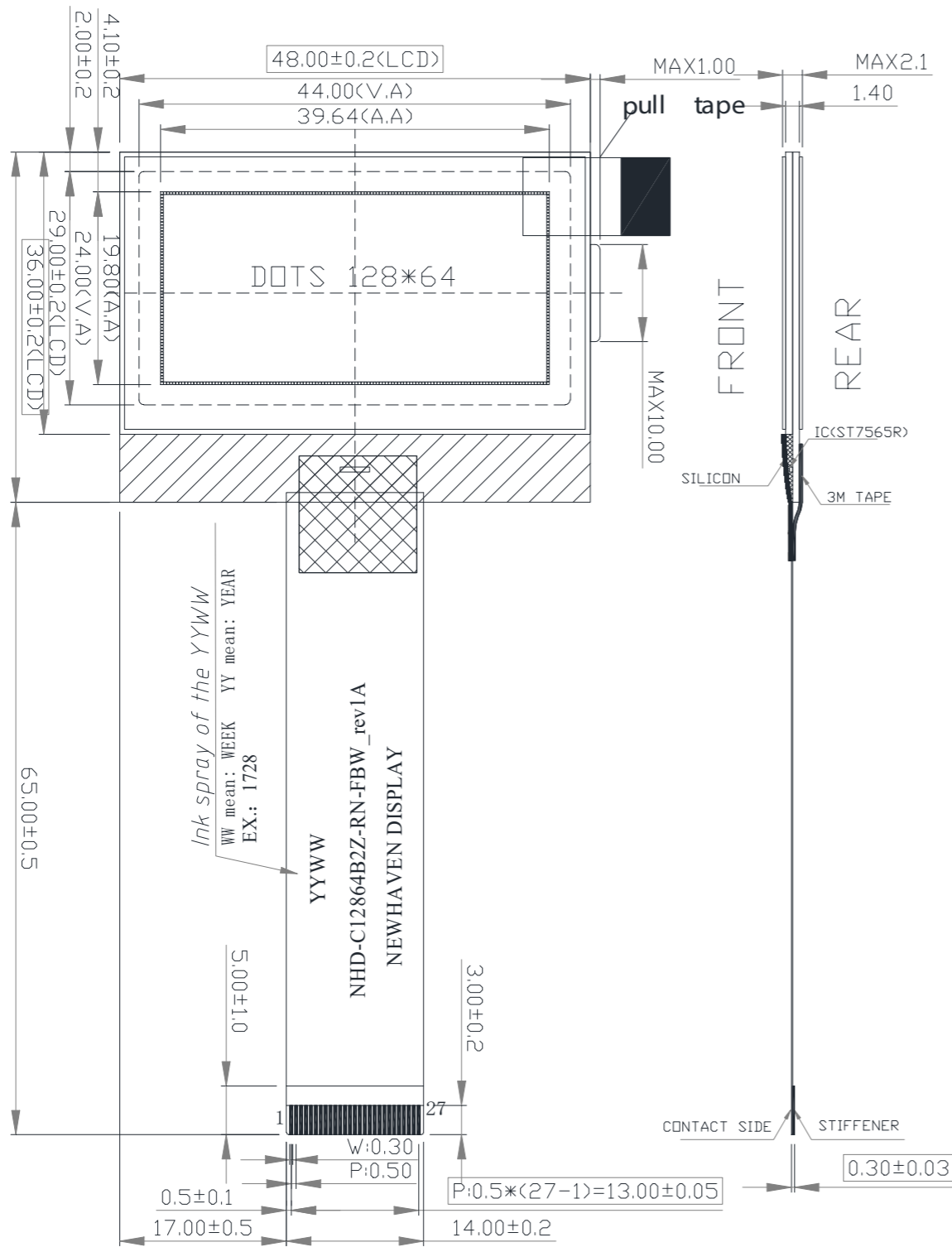
- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** [https://www.newhavendisplay.com/knowledge\\_center.html](https://www.newhavendisplay.com/knowledge_center.html)
- **Quality Center:** [https://www.newhavendisplay.com/quality\\_center.html](https://www.newhavendisplay.com/quality_center.html)
- **Precautions for using LCDs/LCMs:** <https://www.newhavendisplay.com/specs/precautions.pdf>
- **Warranty / Terms & Conditions:** <https://www.newhavendisplay.com/terms.html>



## Document Revision History

| Revision | Date        | Description  | Changed By |
|----------|-------------|--|------------|
| 0        | 05/12/2008  | Initial Release  | -          |
| 1        | 03/18/2009  | User Guide Reformat                                    | -          |
| 2        | 007/14/2009 | User Guide Reformat                                    | BE         |
| 3        | 5/10/2011   | Code Updated   | JT         |
| 4        | 11/07/2011  | Example Program Updated                                | AK         |
| 5        | 08/25/2016  | Mechanical Drawing, Electrical & Optical Char. Updated | SB         |
| 6        | 03/27/18    | Mechanical Drawing Updated                             | SB         |
| 7        | 10/19/2025  | Date Code Updated on Mechanical Drawing                | KL         |

# Mechanical Drawing



| 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   |

## Product Description: 128x64 Graphic COG LCD

1. Driver IC: ST7565R
2. Driving Mode: 1/65 Duty, 1/9 Bias
3. Interface: 8-bit 8080 Parallel
4. Power Requirement: 3.3V LCD
5. Optical Features: FSTN (+), Reflective, 6:00 View
6. Recommended FFC Connector: 27pin 0.5mm pitch

|   |   |                           |
|---|---|---------------------------|
| <b>Standard Tolerance:</b><br>(Unless otherwise specified)<br><br>Linear: ±0.3mm  |   |                           |
|   | Drawing/Part Number:<br><b>NHD-C12864B2Z-RN-FBW</b> | Revision:<br><b>1A</b>    |
| <b>Unless otherwise specified:</b><br>• Dimensions are in Millimeters<br>• Third Angle Projection   | Drawn By: K. Lewis                                  | Approved By: K. Lewis     |
|   | Drawn Date: 10/19/2025                              | Approved Date: 10/19/2025 |
| 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. |   |                           |

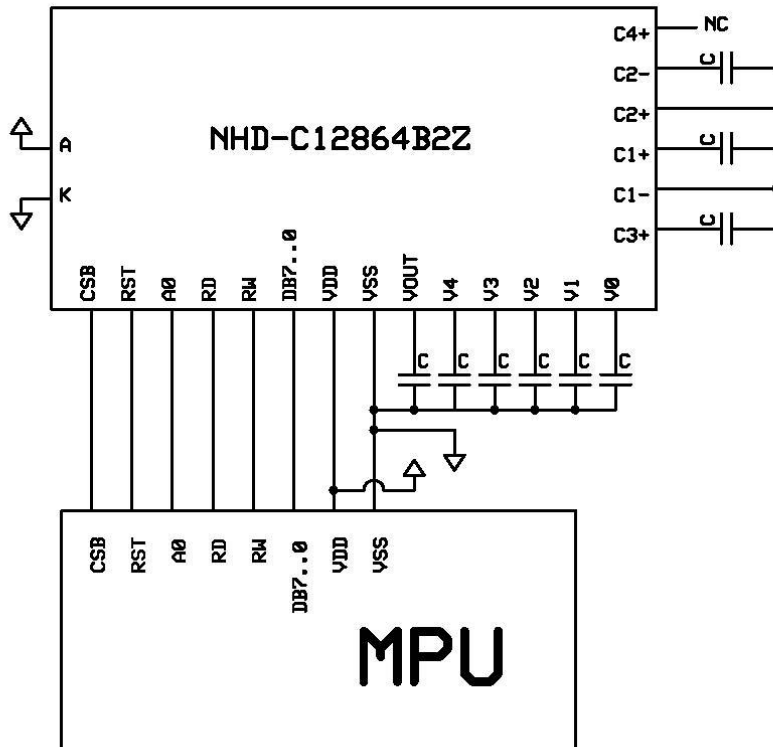
## Pin Description

| 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:** ---

## Wiring Diagram



## 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 | 0.1                 | 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    | φY+            | CR ≥ 2                 | -    | 30   | -    | °    |
|                        | Bottom | φY-            |                        | -    | 45   | -    | °    |
|                        | Left   | θX-            |                        | -    | 40   | -    | °    |
|                        | Right  | θX+            |                        | -    | 40   | -    | °    |
| Contrast Ratio         |        | CR             | -                      | 3    | 6    | -    | -    |
| Response Time          | Rise   | T <sub>R</sub> | T <sub>OP</sub> = 25°C | -    | 60   | 150  | ms   |
|                        | Fall   | T <sub>F</sub> |                        | -    | 150  | 200  | ms   |

## Controller Information

Built-in ST7565R Controller: <https://support.newhavendisplay.com/hc/en-us/articles/4414899357591-ST7565R>



## 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        | LCD display ON/OFF<br>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 |                |    |          |   | 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 |    |                         |              |                                  |                |    |          | 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        | Sets the display RAM address SEG output correspondence<br>0: normal, 1: reverse |  |
| (9) Display normal/reverse  | 0            | 1   | 0   | 1          | 0  | 1                       | 0            | 0                                | 1              | 1  | 0        | Sets the LCD display normal/ reverse<br>0: normal, 1: reverse                   |  |
| (10) Display all points ON/OFF                                    | 0            | 1   | 0   | 1          | 0  | 1                       | 0            | 0                                | 1              | 0  | 0        | Display all points<br>0: normal display<br>1: all points ON                     |  |
| (11) LCD bias set   | 0            | 1   | 0   | 1          | 0  | 1                       | 0            | 0                                | 0              | 1  | 0        | Sets the LCD drive voltage bias ratio<br>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<br>At write: +1<br>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                                | *              | *  | *        | Select COM output scan direction<br>0: normal direction<br>1: reverse direction |  |
| (16) Power control set  | 0            | 1   | 0   | 0          | 0  | 1                       | 0            | 1                                | Operating mode |    | 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        | 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 V <sub>0</sub> output voltage electronic volume register                |  |
| Electronic volume register set                                    |              |     |     | 0          | 0  | Electronic volume value |              |                                  |                |    |          |   |  |
| (19) Sleep mode set   | 0            | 1   | 0   | 1          | 0  | 1                       | 0            | 1                                | 1              | 0  | 0        | 0: Sleep mode, 1: Normal mode   |  |
| (20) Booster ratio set  | 0            | 1   | 0   | 1          | 1  | 1                       | 1            | 1                                | 0              | 0  | 0        | select booster ratio<br>00: 2x,3x,4x<br>01: 5x<br>11: 6x                        |  |
| (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

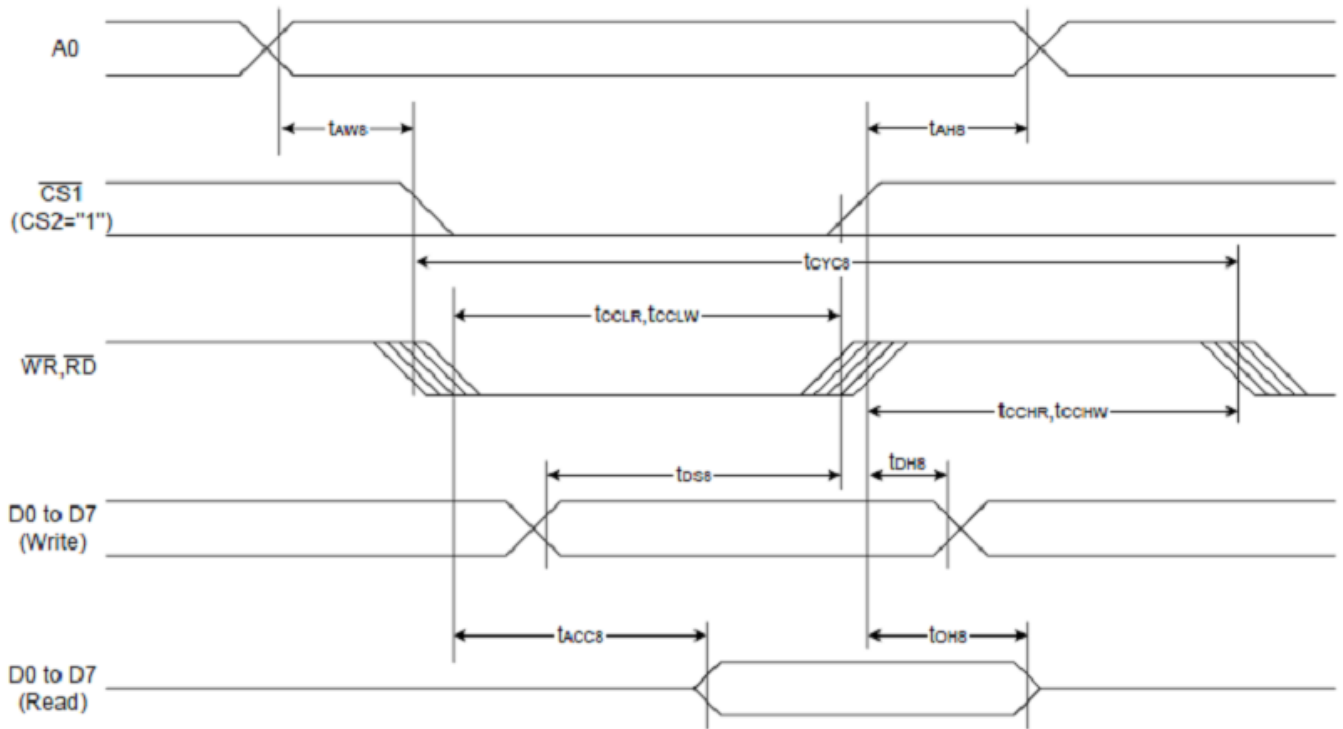
System bus read/write characteristics 1 (for the 8080 series MPU)

(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<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=1.5kΩ, CS=100pF<br>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.



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