

# NHD-0.6-6464G

## Graphic Color OLED Display

|       |                    |
|-------|--------------------|
| NHD-  | Newhaven Display   |
| 0.6-  | 0.6" Diagonal Size |
| 6464- | 64 x 64 Pixels     |
| G-    | OLED Glass         |

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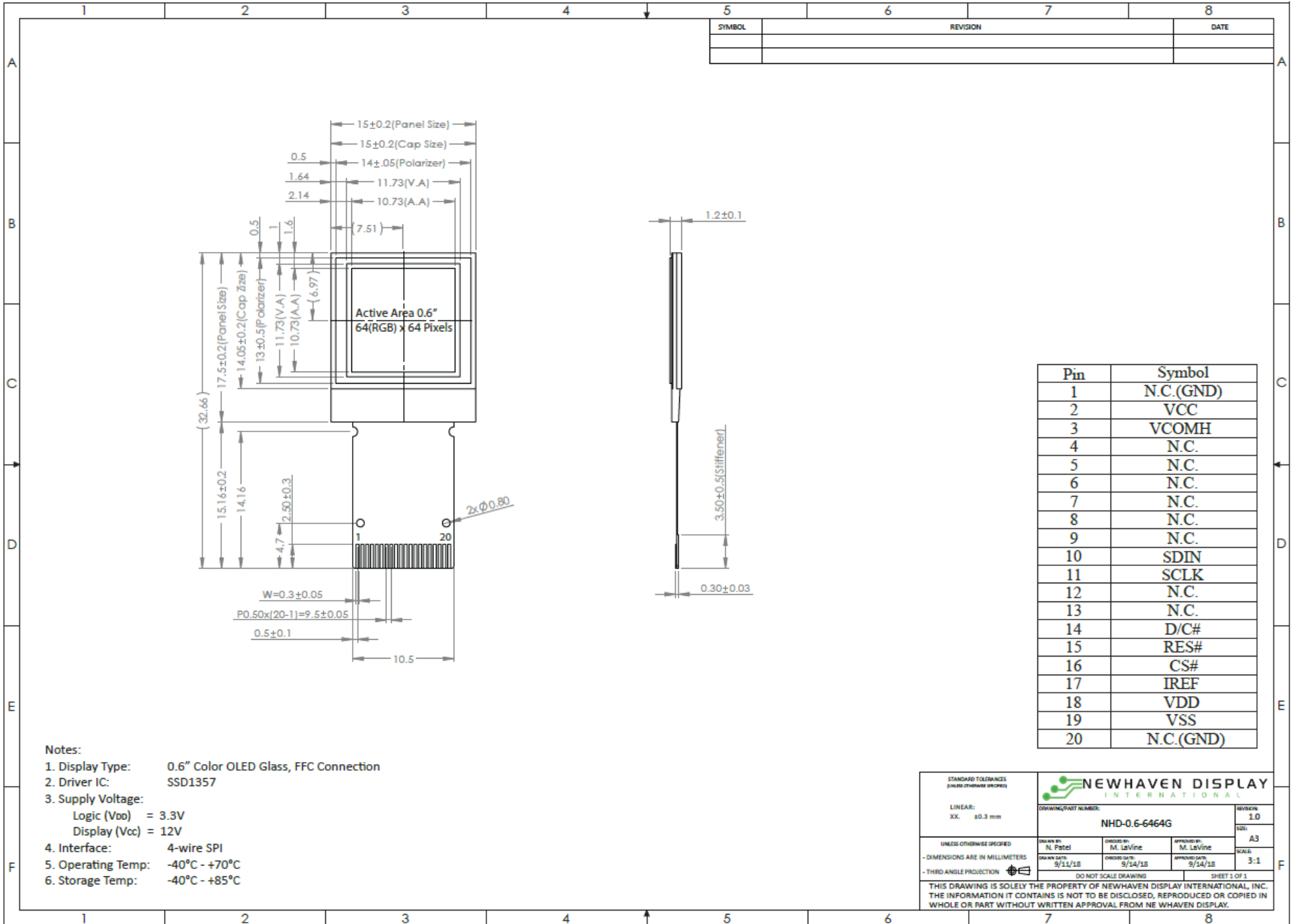
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## Document Revision History

| Revision | Date      | Description                        | Changed by |
|----------|-----------|------------------------------------|------------|
| -        | 1/25/19   | Initial Release                    | ML         |
| 1        | 6/19/2019 | Updated Recommended OLED Connector | AS         |

## Functions and Features

- 64 x 64 pixel resolution
- Built-in SSD1357 controller
- 4-wire SPI interface
- RoHS compliant



| SYMBOL | REVISION | DATE |
|--------|----------|------|
|        |          |      |

| Pin | Symbol    |
|-----|-----------|
| 1   | N.C.(GND) |
| 2   | VCC       |
| 3   | VCOMH     |
| 4   | N.C.      |
| 5   | N.C.      |
| 6   | N.C.      |
| 7   | N.C.      |
| 8   | N.C.      |
| 9   | N.C.      |
| 10  | SDIN      |
| 11  | SCLK      |
| 12  | N.C.      |
| 13  | N.C.      |
| 14  | D/C#      |
| 15  | RES#      |
| 16  | CS#       |
| 17  | IREF      |
| 18  | VDD       |
| 19  | VSS       |
| 20  | N.C.(GND) |

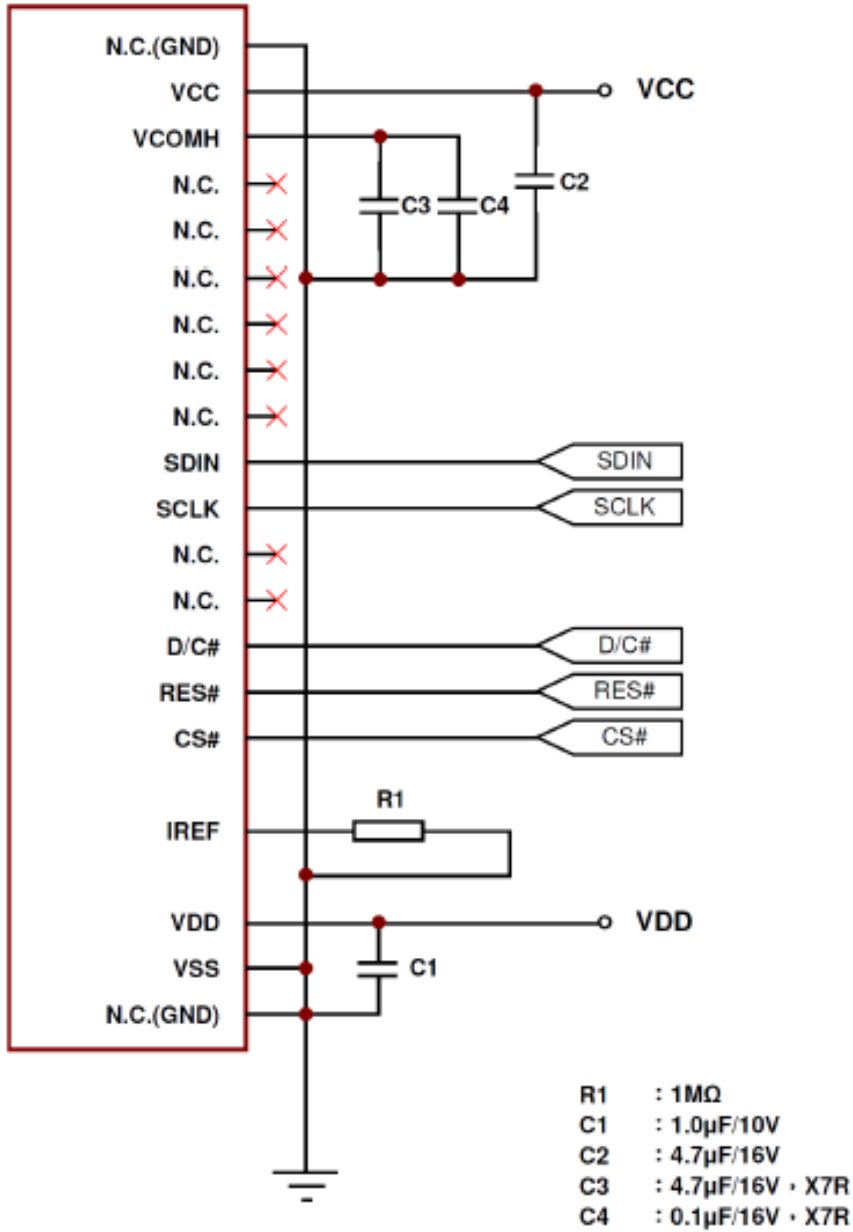
|   |  |                                       |                           |
|---|--|---------------------------------------|---------------------------|
| STANDARD TOLERANCES<br>(UNLESS OTHERWISE SPECIFIED)   |  |                                       |                           |
| LINEAR:<br>XX ±0.3 mm   |  | DRAWING/PART NUMBER:<br>NHD-0.6-6464G |                           |
| UNLESS OTHERWISE SPECIFIED  |  | DRAWN BY:<br>N. Patel                 | REVISED BY:<br>M. LaVine  |
| - DIMENSIONS ARE IN MILLIMETERS   |  | DRAWN DATE:<br>9/11/18                | APPROVED DATE:<br>9/14/18 |
| - THIRD ANGLE PROJECTION  |  | DO NOT SCALE DRAWING                  |                           |
|   |  | SHEET 1 OF 1                          |                           |
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## Interface Description

| Pin No. | Symbol            | External Connection | Function Description                             |
|---------|-------------------|---------------------|--|
| 1       | NC (GND)          | -                   | No connect (can be tied to Ground)               |
| 2       | V <sub>CC</sub>   | Power Supply        | Supply voltage for OLED panel                    |
| 3       | V <sub>COMH</sub> | Power Supply        | Voltage output high level for COM signal         |
| 4       | NC                | -                   | No connect                                       |
| 5       | NC                | -                   | No connect                                       |
| 6       | NC                | -                   | No connect                                       |
| 7       | NC                | -                   | No connect                                       |
| 8       | NC                | -                   | No connect                                       |
| 9       | NC                | -                   | No connect                                       |
| 10      | SDIN              | MPU                 | Serial Data Input Signal                         |
| 11      | SCLK              | MPU                 | Serial Clock Input Signal                        |
| 12      | NC                | -                   | No connect                                       |
| 13      | NC                | -                   | No connect                                       |
| 14      | D/C#              | MPU                 | Data/Command selection. LOW: Command. HIGH: Data |
| 15      | RES#              | MPU                 | Active LOW Reset signal                          |
| 16      | CS#               | MPU                 | Active LOW Chip Select signal                    |
| 17      | I <sub>REF</sub>  | Power Supply        | Current reference for brightness adjustment      |
| 18      | V <sub>DD</sub>   | Power Supply        | Supply voltage for Logic                         |
| 19      | V <sub>SS</sub>   | Power Supply        | Ground   |
| 20      | NC (GND)          | -                   | No connect (can be tied to Ground)               |

**Recommended display connector:** 20pin 0.5mm pitch top contact FFC connector (Molex 52745-2033 or equivalent)

# Wiring Diagram



## Electrical Characteristics

| Item                        | Symbol             | Condition                       | Min.                  | Typ. | Max.                  | Unit |
|-----------------------------|--------------------|---------------------------------|-----------------------|------|-----------------------|------|
| Operating Temperature Range | T <sub>OP</sub>    | Absolute Max                    | -40                   | -    | +70                   | °C   |
| Storage Temperature Range   | T <sub>ST</sub>    | Absolute Max                    | -40                   | -    | +85                   | °C   |
| Supply Voltage for Logic    | V <sub>DD</sub>    | -                               | 1.65                  | 3.0  | 3.5                   | V    |
| Supply Voltage for Display  | V <sub>CC</sub>    | -                               | 11.5                  | 12.0 | 12.5                  | V    |
| Supply Current for Logic    | I <sub>DD</sub>    | V <sub>DD</sub> = 3.0V; 100% On | -                     | 720  | 800                   | μA   |
| Supply Current for Display  | I <sub>CC</sub>    | V <sub>CC</sub> = 12V; 50% On   | -                     | 11.5 | 14.4                  | mA   |
|                             |                    | V <sub>CC</sub> = 12V; 100% On  | -                     | 20.7 | 25.9                  | mA   |
| Supply Current (Sleep)      | I <sub>SLEEP</sub> | V <sub>DD</sub> = 3.0V          | -                     | 5    | 20                    | μA   |
| "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>    | -                               | 0.9 * V <sub>DD</sub> | -    | V <sub>DD</sub>       | V    |
| "L" Level output            | V <sub>OL</sub>    | -                               | V <sub>SS</sub>       | -    | 0.1 * V <sub>DD</sub> | V    |

## Optical Characteristics

| Item                   | Symbol         | Condition   | Min.   | Typ.      | Max. | Unit              |
|------------------------|----------------|---|--------|-----------|------|-------------------|
| Optimal Viewing Angles | Top            | φY+   | 80     | -         | -    | °                 |
|                        | Bottom         | φY-   | 80     | -         | -    | °                 |
|                        | Left           | θX-   | 80     | -         | -    | °                 |
|                        | Right          | θX+   | 80     | -         | -    | °                 |
| Contrast Ratio         | CR             | -   | -      | >10,000:1 | -    | -                 |
| Response Time (rise)   | T <sub>R</sub> | -   | -      | 10        | -    | μs                |
| Response Time (fall)   | T <sub>F</sub> | -   | -      | 10        | -    | μs                |
| Brightness             | L <sub>V</sub> | 50% Checkerboard  | 160    | 200       | -    | cd/m <sup>2</sup> |
| Lifetime               | -              | 200 cd/m <sup>2</sup> , T <sub>OP</sub> =25°C<br>50% Checkerboard | 8,000  | -         | -    | Hrs               |
|                        |                | 160 cd/m <sup>2</sup> , T <sub>OP</sub> =25°C<br>50% Checkerboard | 10,000 | -         | -    | Hrs               |

**Note:** Lifetime at typical temperature is based on accelerated high-temperature operation. Lifetime is tested at average 50% pixels on and is rated as Hours until **Half-Brightness**. The Display OFF command can be used to extend the lifetime of the display.

Luminance of active pixels will degrade faster than inactive pixels. Residual (burn-in) images may occur. To avoid this, every pixel should be illuminated uniformly.

## Controller information

Built-in SSD1357 controller.

Please download specification at [www.newhavendisplay.com/appnotes/datasheets/OLEDs/SSD1357.pdf](http://www.newhavendisplay.com/appnotes/datasheets/OLEDs/SSD1357.pdf)

For the full command table and descriptions, please download the following:

[www.newhavendisplay.com/appnotes/datasheets/OLEDs/SSD1357\\_Commands.pdf](http://www.newhavendisplay.com/appnotes/datasheets/OLEDs/SSD1357_Commands.pdf)

## Table of Commands

| Fundamental Command Table |        |                |                |                |                |                |                |                |                |   |  |
|---------------------------|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|--|
| D/C#                      | Hex    | D7             | D6             | D5             | D4             | D3             | D2             | D1             | D0             | Command   | Description  |
| 0                         | 15     | 0              | 0              | 0              | 1              | 0              | 1              | 0              | 1              | Set Column Address                              | A[6:0]: Start Address. [reset=0]<br>B[6:0]: End Address. [reset=127]<br>Range from 0 to 127  |
| 1                         | A[6:0] | *              | A <sub>6</sub> | A <sub>5</sub> | A <sub>4</sub> | A <sub>3</sub> | A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> |   |  |
| 1                         | B[6:0] | *              | B <sub>6</sub> | B <sub>5</sub> | B <sub>4</sub> | B <sub>3</sub> | B <sub>2</sub> | B <sub>1</sub> | B <sub>0</sub> |   |  |
| 0                         | 75     | 0              | 1              | 1              | 1              | 0              | 1              | 0              | 1              | Set Row Address                                 | A[6:0]: Start Address. [reset=0]<br>B[6:0]: End Address. [reset=127]<br>Range from 0 to 127  |
| 1                         | A[6:0] | *              | A <sub>6</sub> | A <sub>5</sub> | A <sub>4</sub> | A <sub>3</sub> | A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> |   |  |
| 1                         | B[6:0] | *              | B <sub>6</sub> | B <sub>5</sub> | B <sub>4</sub> | B <sub>3</sub> | B <sub>2</sub> | B <sub>1</sub> | B <sub>0</sub> |   |  |
| 0                         | 5C     | 0              | 1              | 0              | 1              | 1              | 1              | 0              | 0              | Write RAM Command                               | Enable MCU to write Data into RAM  |
| 0                         | 5D     | 0              | 1              | 0              | 1              | 1              | 1              | 0              | 1              | Read RAM Command                                | Enable MCU to read Data from RAM   |
| 0                         | A0     | 1              | 0              | 1              | 0              | 0              | 0              | 0              | 0              | Set Re-map / Color Depth (Display RAM to Panel) | A[0]=0b, Horizontal address increment [reset]<br>A[0]=1b, Vertical address increment   |
| 1                         | A[7:0] | A <sub>7</sub> | A <sub>6</sub> | A <sub>5</sub> | A <sub>4</sub> | A <sub>3</sub> | A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> |   |  |
| 1                         | B[7:0] | 0              | 0              | 0              | 0              | 0              | 0              | 0              | 0              |   |  |
|                           |        |                |                |                |                |                |                |                |                |   | <p>A[1]=0b, Column address 0 is mapped to SEG0 [reset]<br/>A[1]=1b, Column address 127 is mapped to SEG0</p> <p>A[2]=0b, Color sequence: A <math>\boxtimes</math> B <math>\boxtimes</math> C [reset]<br/>A[2]=1b, Color sequence is swapped: C <math>\boxtimes</math> B <math>\boxtimes</math> A</p> <p>A[3]=0b, Reserved [reset]<br/>A[3]=1b, Reserved</p> <p>A[4]=0b, Scan from COM0 to COM[N-1] [reset]<br/>A[4]=1b, Scan from COM[N-1] to COM0. Where N is the Multiplex ratio.</p> <p>A[5]=0b, Disable COM Split Odd Even<br/>A[5]=1b, Enable COM Split Odd Even [reset]</p> <p>A[7:6] Set Color Depth,<br/>00b: 256color<br/>01b: 65k color [reset]<br/>10b: 262k color<br/>11b Pseudo 262k color, 16-bit format 2</p> <p>Refer to Product Preview Table 6-6 for details</p> |

| Fundamental Command Table |              |                     |                     |                     |                     |                     |                     |                     |                     |   |   |
|---------------------------|--------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---|---|
| D/C#                      | Hex          | D7                  | D6                  | D5                  | D4                  | D3                  | D2                  | D1                  | D0                  | Command   | Description   |
| 0<br>1                    | A1<br>A[6:0] | 1<br>*              | 0<br>A <sub>6</sub> | 1<br>A <sub>5</sub> | 0<br>A <sub>4</sub> | 0<br>A <sub>3</sub> | 0<br>A <sub>2</sub> | 0<br>A <sub>1</sub> | 1<br>A <sub>0</sub> | Set Display Start Line                            | Set vertical scroll by RAM from 0~127. [reset=00h]  |
| 0<br>1                    | A2<br>A[6:0] | 1<br>*              | 0<br>A <sub>6</sub> | 1<br>A <sub>5</sub> | 0<br>A <sub>4</sub> | 0<br>A <sub>3</sub> | 0<br>A <sub>2</sub> | 1<br>A <sub>1</sub> | 0<br>A <sub>0</sub> | Set Display Offset                                | Set vertical scroll by Row from 0-127. [reset=00h]  |
| 0                         | A4~A7        | 1                   | 0                   | 1                   | 0                   | 0                   | 1                   | X <sub>1</sub>      | X <sub>0</sub>      | Set Display Mode                                  | A4h: All OFF<br>A5h: All ON (All pixels have GS63)<br>A6h : Reset to normal display [reset]<br>A7h: Inverse Display (GS0 -> GS63, GS1 -> GS62, ...)   |
| 0                         | AE~AF        | 1                   | 0                   | 1                   | 0                   | 1                   | 1                   | 1                   | X <sub>0</sub>      | Set Sleep mode ON/OFF                             | AEh = Sleep mode On (Display OFF)<br>AFh = Sleep mode OFF (Display ON)  |
| 0<br>1                    | B1<br>A[7:0] | 1<br>A <sub>7</sub> | 0<br>A <sub>6</sub> | 1<br>A <sub>5</sub> | 1<br>A <sub>4</sub> | 0<br>A <sub>3</sub> | 0<br>A <sub>2</sub> | 0<br>A <sub>1</sub> | 1<br>A <sub>0</sub> | Set Reset (Phase 1) / Pre-charge (Phase 2) period | A[3:0] Phase 1 period of 2~30 DCLK(s) clocks [reset=0100b]<br>A[3:0]:<br>0 invalid<br>1 = 2 DCLKs<br>2 = 4 DCLKs<br>:<br>15 = 30DCLKs<br><br>A[7:4] Phase 2 period of 2~30 DCLK(s) clocks [reset=1000b]<br>A[7:4]:<br>0 invalid<br>1 = 2 DCLKs<br>2 = 4 DCLKs<br>:<br>15 =30DCLKs<br><br>Note<br>(1) 0 DCLK is invalid in phase 1 & phase 2 |



| Fundamental Command Table |               |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
|---------------------------|---------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|---|---|--------|--------|------|-------------|------|-------------|------|-------------|------|-------------|------|--------------|------|--------------|------|--------------|------|---------------|------|---------------|--------|---------|
| D/C#                      | Hex           | D7               | D6               | D5               | D4               | D3               | D2               | D1               | D0               | Command   | Description   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0                         | B3            | 1                | 0                | 1                | 1                | 0                | 0                | 1                | 1                | Front Clock Divider (DivSet)/ Oscillator Frequency                                | A[3:0] [reset=0000b], divide by DIVSET where <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>A[3:0]</th> <th>DIVSET</th> </tr> </thead> <tbody> <tr><td>0000</td><td>divide by 1</td></tr> <tr><td>0001</td><td>divide by 2</td></tr> <tr><td>0010</td><td>divide by 4</td></tr> <tr><td>0011</td><td>divide by 8</td></tr> <tr><td>0100</td><td>divide by 16</td></tr> <tr><td>0101</td><td>divide by 32</td></tr> <tr><td>0110</td><td>divide by 64</td></tr> <tr><td>0111</td><td>divide by 128</td></tr> <tr><td>1000</td><td>divide by 256</td></tr> <tr><td>&gt;=1001</td><td>invalid</td></tr> </tbody> </table>  | A[3:0] | DIVSET | 0000 | divide by 1 | 0001 | divide by 2 | 0010 | divide by 4 | 0011 | divide by 8 | 0100 | divide by 16 | 0101 | divide by 32 | 0110 | divide by 64 | 0111 | divide by 128 | 1000 | divide by 256 | >=1001 | invalid |
| A[3:0]                    | DIVSET        |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0000                      | divide by 1   |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0001                      | divide by 2   |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0010                      | divide by 4   |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0011                      | divide by 8   |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0100                      | divide by 16  |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0101                      | divide by 32  |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0110                      | divide by 64  |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0111                      | divide by 128 |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1000                      | divide by 256 |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| >=1001                    | invalid       |                  |                  |                  |                  |                  |                  |                  |                  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | A[7:0]        | A <sub>7</sub>   | A <sub>6</sub>   | A <sub>5</sub>   | A <sub>4</sub>   | A <sub>3</sub>   | A <sub>2</sub>   | A <sub>1</sub>   | A <sub>0</sub>   | A[7:4] Oscillator frequency, frequency increases as level increases [reset=0010b] |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0                         | B6            | 1                | 0                | 1                | 1                | 0                | 1                | 0                | 0                | Set Second Pre-charge Period  | A[3:0] Set Second Pre-charge Period<br><br>0000b invalid<br>0001b 1 DCLKS<br>0010b 2 DCLKS<br>.....<br>1000 8 DCLKS [reset]<br>.....<br>1111 15 DCLKS   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | A[3:0]        | 0                | 0                | 0                | 0                | A <sub>3</sub>   | A <sub>2</sub>   | A <sub>1</sub>   | A <sub>0</sub>   |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 0                         | B8            | 1                | 0                | 1                | 1                | 1                | 0                | 0                | 0                | Master Look Up Table for Gray Scale Pulse width (Color A,B,C)                     | The next 63 data bytes define Gray Scale (GS) Table by setting the gray scale pulse width in unit of DCLK's (ranges from 0d ~ 180d).<br><br>A1[7:0]: Gamma Setting for GS1,<br>A2[7:0]: Gamma Setting for GS2,<br>.....<br>A62[7:0]: Gamma Setting for GS62,<br>A63[7:0]: Gamma Setting for GS63<br><br><b>Note</b><br>( <sup>1</sup> ) 0 ∅ Setting of GS1 < Setting of GS2 < Setting of GS3..... < Setting of GS62 < Setting of GS63<br>( <sup>2</sup> ) GS0 does not has pre-charge and current drive stages.<br>( <sup>3</sup> ) GS1 can be set as only pre-charge but no current drive stage by input gamma setting for GS1 equals 0.<br>( <sup>4</sup> ) When command B8h is input only, color A, B, C will follow the master LUT.<br>( <sup>5</sup> ) When command BCh is input, it selects individual LUT for color A, GS1~31A; When command BDh is input, it selects individual LUT for color C, GS1~31C<br>( <sup>6</sup> ) To select individual LUT for color B, A and C, command B8h should be input before command BCh and BDh, |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | A1[7:0]       | A1 <sub>7</sub>  | A1 <sub>6</sub>  | A1 <sub>5</sub>  | A1 <sub>4</sub>  | A1 <sub>3</sub>  | A1 <sub>2</sub>  | A1 <sub>1</sub>  | A1 <sub>0</sub>  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | A2[7:0]       | A2 <sub>7</sub>  | A2 <sub>6</sub>  | A2 <sub>5</sub>  | A2 <sub>4</sub>  | A2 <sub>3</sub>  | A2 <sub>2</sub>  | A2 <sub>1</sub>  | A2 <sub>0</sub>  |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | .             | .                | .                | .                | .                | .                | .                | .                | .                |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | .             | .                | .                | .                | .                | .                | .                | .                | .                |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | .             | .                | .                | .                | .                | .                | .                | .                | .                |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | A62[7:0]      | A62 <sub>7</sub> | A62 <sub>6</sub> | A62 <sub>5</sub> | A62 <sub>4</sub> | A62 <sub>3</sub> | A62 <sub>2</sub> | A62 <sub>1</sub> | A62 <sub>0</sub> |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |
| 1                         | A63[7:0]      | A63 <sub>7</sub> | A63 <sub>6</sub> | A63 <sub>5</sub> | A63 <sub>4</sub> | A63 <sub>3</sub> | A63 <sub>2</sub> | A63 <sub>1</sub> | A63 <sub>0</sub> |   |   |        |        |      |             |      |             |      |             |      |             |      |              |      |              |      |              |      |               |      |               |        |         |

| Fundamental Command Table       |   |  |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
|---------------------------------|---|--|--|--|--|--|--|--|--|---|---|---------|----------|--------------------|---------------|---------------|------------------------|---------------|---------------|---------------|---------------|---------------|--------------------------------|-------|-----|--------------------------|------------------|------------------|------------------|--|------------------|
| D/C#                            | Hex   | D7   | D6   | D5   | D4   | D3   | D2   | D1   | D0   | Command   | Description   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| 0                               | B9  | 1  | 0  | 1  | 1  | 1  | 0  | 0  | 1  | Use Built-in Linear LUT [reset= linear]                       | Reset to default Look Up Table:   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
|                                 |   |  |  |  |  |  |  |  |  |   | <table border="1"> <thead> <tr> <th>Color A</th> <th>Color B</th> <th>Color C</th> </tr> </thead> <tbody> <tr> <td>GS1A = 0 DCLK</td> <td>GS1B = 0 DCLK</td> <td>GS1C = 0 DCLK</td> </tr> <tr> <td>GS2A = 4 DCLK</td> <td>GS2B = 2 DCLK</td> <td>GS2C = 4 DCLK</td> </tr> <tr> <td>GS3A = 8 DCLK</td> <td>GS3B = 4 DCLK</td> <td>GS3C = 8 DCLK</td> </tr> <tr> <td>...</td> <td>...</td> <td>...</td> </tr> <tr> <td>GS31A = 120 DCLK</td> <td>GS62B = 122 DCLK</td> <td>GS31C = 120 DCLK</td> </tr> <tr> <td></td> <td>GS63B = 124 DCLK</td> <td></td> </tr> </tbody> </table>   | Color A | Color B  | Color C            | GS1A = 0 DCLK | GS1B = 0 DCLK | GS1C = 0 DCLK          | GS2A = 4 DCLK | GS2B = 2 DCLK | GS2C = 4 DCLK | GS3A = 8 DCLK | GS3B = 4 DCLK | GS3C = 8 DCLK                  | ...   | ... | ...                      | GS31A = 120 DCLK | GS62B = 122 DCLK | GS31C = 120 DCLK |  | GS63B = 124 DCLK |
| Color A                         | Color B   | Color C  |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| GS1A = 0 DCLK                   | GS1B = 0 DCLK   | GS1C = 0 DCLK  |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| GS2A = 4 DCLK                   | GS2B = 2 DCLK   | GS2C = 4 DCLK  |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| GS3A = 8 DCLK                   | GS3B = 4 DCLK   | GS3C = 8 DCLK  |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| ...                             | ...   | ...  |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| GS31A = 120 DCLK                | GS62B = 122 DCLK  | GS31C = 120 DCLK   |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
|                                 | GS63B = 124 DCLK  |  |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| 0<br>1                          | BB<br>A[4:0]  | 1<br>0   | 0<br>0   | 1<br>0   | 1<br>A <sub>4</sub>  | 1<br>A <sub>3</sub>  | 0<br>A <sub>2</sub>  | 1<br>A <sub>1</sub>  | 1<br>A <sub>0</sub>  | Set Pre-charge voltage  | Set pre-charge voltage level.[reset = 11110b]   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
|                                 |   |  |  |  |  |  |  |  |  |   | <table border="1"> <thead> <tr> <th>A[4:0]</th> <th>Hex code</th> <th>pre-charge voltage</th> </tr> </thead> <tbody> <tr> <td>00000</td> <td>00h</td> <td>0.10 x V<sub>CC</sub></td> </tr> <tr> <td>:</td> <td>:</td> <td>:</td> </tr> <tr> <td>11110</td> <td>1Eh</td> <td>0.50 x V<sub>CC</sub> [reset]</td> </tr> <tr> <td>11111</td> <td>1Fh</td> <td>0.5133 x V<sub>CC</sub></td> </tr> </tbody> </table> <p><b>Note</b><br/>(1)Pre-charge voltage level must be smaller than COM deselect voltage level</p>   | A[4:0]  | Hex code | pre-charge voltage | 00000         | 00h           | 0.10 x V <sub>CC</sub> | :             | :             | :             | 11110         | 1Eh           | 0.50 x V <sub>CC</sub> [reset] | 11111 | 1Fh | 0.5133 x V <sub>CC</sub> |                  |                  |                  |  |                  |
| A[4:0]                          | Hex code  | pre-charge voltage   |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| 00000                           | 00h   | 0.10 x V <sub>CC</sub>   |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| :                               | :   | :  |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| 11110                           | 1Eh   | 0.50 x V <sub>CC</sub> [reset]   |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| 11111                           | 1Fh   | 0.5133 x V <sub>CC</sub>   |  |  |  |  |  |  |  |   |   |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
| 0<br>1<br>1<br>1<br>1<br>1<br>1 | BC<br>A1[7:0]<br>A2[7:0]<br>.<br>.<br>.<br>A30[7:0]<br>A31[7:0] | 1<br>A1 <sub>7</sub><br>A2 <sub>7</sub><br>.<br>.<br>.<br>A30 <sub>7</sub><br>A31 <sub>7</sub> | 0<br>A1 <sub>6</sub><br>A2 <sub>6</sub><br>.<br>.<br>.<br>A30 <sub>6</sub><br>A31 <sub>6</sub> | 1<br>A1 <sub>5</sub><br>A2 <sub>5</sub><br>.<br>.<br>.<br>A30 <sub>5</sub><br>A31 <sub>5</sub> | 1<br>A1 <sub>4</sub><br>A2 <sub>4</sub><br>.<br>.<br>.<br>A30 <sub>4</sub><br>A31 <sub>4</sub> | 1<br>A1 <sub>3</sub><br>A2 <sub>3</sub><br>.<br>.<br>.<br>A30 <sub>3</sub><br>A31 <sub>3</sub> | 1<br>A1 <sub>2</sub><br>A2 <sub>2</sub><br>.<br>.<br>.<br>A30 <sub>2</sub><br>A31 <sub>2</sub> | 0<br>A1 <sub>1</sub><br>A2 <sub>1</sub><br>.<br>.<br>.<br>A30 <sub>1</sub><br>A31 <sub>1</sub> | 0<br>A1 <sub>0</sub><br>A2 <sub>0</sub><br>.<br>.<br>.<br>A30 <sub>0</sub><br>A31 <sub>0</sub> | Individual Look Up Table for Gray Scale Pulse width (Color A) | The next 31 data bytes define Gray Scale (GS) Table by setting the gray scale pulse width in unit of DCLK's (ranges from 0d ~ 180d) for color A.  |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |
|                                 |   |  |  |  |  |  |  |  |  |   | <p>A1[7:0]: Gamma Setting for GS1A,<br/>A2[7:0]: Gamma Setting for GS2A,<br/>:<br/>A62[7:0]: Gamma Setting for GS30A,<br/>A63[7:0]: Gamma Setting for GS31A</p> <p><b>Note</b><br/>(1) 0 ≠ Setting of GS1 &lt; Setting of GS2 &lt; Setting of GS3..... &lt; Setting of GS30 &lt; Setting of GS31<br/>(2) GS0 does not has pre-charge and current drive stages.<br/>(3) GS1 can be set as only pre-charge but no current drive stage by input gamma setting for GS1 equals 0.<br/>(4) When command B8h is input, it selects one LUT for color A, B and C. i.e. GS1~31A, GS1~63B and GS1~31C are updated.<br/>(5) Command B8h should be input before command BCh and BDh to select individual LUT for color B, A and C.</p> |         |          |                    |               |               |                        |               |               |               |               |               |                                |       |     |                          |                  |                  |                  |  |                  |

| Fundamental Command Table  |          |                                |                  |                  |                  |                  |                  |                  |                  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
|--|----------|--------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|---|---|----------|-------------------|-----|-----|------------------------|---|---|---|-----|-----|--------------------------------|---|---|---|-----|-----|------------------------|
| D/C#   | Hex      | D7                             | D6               | D5               | D4               | D3               | D2               | D1               | D0               | Command   | Description   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 0  | BD       | 1                              | 0                | 1                | 1                | 1                | 1                | 0                | 1                | Individual Look<br>Up Table for<br>Gray Scale<br>Pulse width<br>(Color C) | The next 31 data bytes define Gray Scale (GS) Table by setting the gray scale pulse width in unit of DCLK's (ranges from 0d ~ 180d) for color C.<br><br>A1[7:0]: Gamma Setting for GS1C,<br>A2[7:0]: Gamma Setting for GS2C,<br>.<br>.<br>A62[7:0]: Gamma Setting for GS30C,<br>A63[7:0]: Gamma Setting for GS31C<br><br><b>Note</b><br>(1) 0 $\boxtimes$ Setting of GS1 < Setting of GS2 < Setting of GS3.....<br>< Setting of GS30 < Setting of GS31<br>(2) GS0 does not has pre-charge and current drive stages.<br>(3) GS1 can be set as only pre-charge but no current drive stage by input gamma setting for GS1 equals 0.<br>(4) When command B8h is input, it selects one LUT for color A, B and C. i.e. GS1~31A, GS1~63B and GS1~31C are updated.<br>(5) Command B8h should be input before command BCh and BDh to select individual LUT for color B, A and C. |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | A1[7:0]  | A1 <sub>7</sub>                | A1 <sub>6</sub>  | A1 <sub>5</sub>  | A1 <sub>4</sub>  | A1 <sub>3</sub>  | A1 <sub>2</sub>  | A1 <sub>1</sub>  | A1 <sub>0</sub>  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | A2[7:0]  | A2 <sub>7</sub>                | A2 <sub>6</sub>  | A2 <sub>5</sub>  | A2 <sub>4</sub>  | A2 <sub>3</sub>  | A2 <sub>2</sub>  | A2 <sub>1</sub>  | A2 <sub>0</sub>  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | .        | .                              | .                | .                | .                | .                | .                | .                | .                |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | .        | .                              | .                | .                | .                | .                | .                | .                | .                |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | .        | .                              | .                | .                | .                | .                | .                | .                | .                |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | A30[7:0] | A30 <sub>7</sub>               | A30 <sub>6</sub> | A30 <sub>5</sub> | A30 <sub>4</sub> | A30 <sub>3</sub> | A30 <sub>2</sub> | A30 <sub>1</sub> | A30 <sub>0</sub> |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | A31[7:0] | A31 <sub>7</sub>               | A31 <sub>6</sub> | A31 <sub>5</sub> | A31 <sub>4</sub> | A31 <sub>3</sub> | A31 <sub>2</sub> | A31 <sub>1</sub> | A31 <sub>0</sub> |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 0  | BE       | 1                              | 0                | 1                | 1                | 1                | 1                | 1                | 0                | Set V <sub>COMH</sub><br>Voltage  | Set COM deselect voltage level [reset = 05h]  |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | A[2:0]   | 0                              | 0                | 0                | 0                | 0                | A <sub>2</sub>   | A <sub>1</sub>   | A <sub>0</sub>   |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| <table border="1"> <thead> <tr> <th>A[2:0]</th> <th>Hex code</th> <th>V<sub>COMH</sub></th> </tr> </thead> <tbody> <tr> <td>000</td> <td>00h</td> <td>0.72 x V<sub>CC</sub></td> </tr> <tr> <td>:</td> <td>:</td> <td>:</td> </tr> <tr> <td>101</td> <td>05h</td> <td>0.82 x V<sub>CC</sub> [reset]</td> </tr> <tr> <td>:</td> <td>:</td> <td>:</td> </tr> <tr> <td>111</td> <td>07h</td> <td>0.86 x V<sub>CC</sub></td> </tr> </tbody> </table> |          |                                |                  |                  |                  |                  |                  |                  |                  |   | A[2:0]  | Hex code | V <sub>COMH</sub> | 000 | 00h | 0.72 x V <sub>CC</sub> | : | : | : | 101 | 05h | 0.82 x V <sub>CC</sub> [reset] | : | : | : | 111 | 07h | 0.86 x V <sub>CC</sub> |
| A[2:0]   | Hex code | V <sub>COMH</sub>              |                  |                  |                  |                  |                  |                  |                  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 000  | 00h      | 0.72 x V <sub>CC</sub>         |                  |                  |                  |                  |                  |                  |                  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| :  | :        | :                              |                  |                  |                  |                  |                  |                  |                  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 101  | 05h      | 0.82 x V <sub>CC</sub> [reset] |                  |                  |                  |                  |                  |                  |                  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| :  | :        | :                              |                  |                  |                  |                  |                  |                  |                  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 111  | 07h      | 0.86 x V <sub>CC</sub>         |                  |                  |                  |                  |                  |                  |                  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 0  | C1       | 1                              | 1                | 0                | 0                | 0                | 0                | 0                | 1                | Set Contrast<br>Current for<br>Color A,B,C                                | A[7:0] Contrast Value Color A [reset=7Fh]<br>B[7:0] Contrast Value Color B [reset=7Fh]<br>C[7:0] Contrast Value Color C [reset=7Fh]   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | A[7:0]   | A <sub>7</sub>                 | A <sub>6</sub>   | A <sub>5</sub>   | A <sub>4</sub>   | A <sub>3</sub>   | A <sub>2</sub>   | A <sub>1</sub>   | A <sub>0</sub>   |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | B[7:0]   | B <sub>7</sub>                 | B <sub>6</sub>   | B <sub>5</sub>   | B <sub>4</sub>   | B <sub>3</sub>   | B <sub>2</sub>   | B <sub>1</sub>   | B <sub>0</sub>   |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | C[7:0]   | C <sub>7</sub>                 | C <sub>6</sub>   | C <sub>5</sub>   | C <sub>4</sub>   | C <sub>3</sub>   | C <sub>2</sub>   | C <sub>1</sub>   | C <sub>0</sub>   |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 0  | C7       | 1                              | 1                | 0                | 0                | 0                | 1                | 1                | 1                | Master Contrast<br>Current Control  | A[3:0] :<br>0000b reduce output currents for all colors to 1/16<br>0001b reduce output currents for all colors to 2/16<br>.....<br>1110b reduce output currents for all colors to 15/16<br>1111b no change [reset]  |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | A[3:0]   | *                              | *                | *                | *                | A <sub>3</sub>   | A <sub>2</sub>   | A <sub>1</sub>   | A <sub>0</sub>   |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 0  | CA       | 1                              | 1                | 0                | 0                | 1                | 0                | 1                | 0                | Set MUX Ratio   | A[6:0] MUX ratio 4MUX ~ 128MUX, [reset=127], (Range from 3 to 127)  |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 1  | A[6:0]   | 0                              | A <sub>6</sub>   | A <sub>5</sub>   | A <sub>4</sub>   | A <sub>3</sub>   | A <sub>2</sub>   | A <sub>1</sub>   | A <sub>0</sub>   |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
| 0  | E3       | 1                              | 1                | 1                | 0                | 0                | 0                | 1                | 1                | NOP   | Command for No Operation  |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |
|  |          |                                |                  |                  |                  |                  |                  |                  |                  |   |   |          |                   |     |     |                        |   |   |   |     |     |                                |   |   |   |     |     |                        |

| Fundamental Command Table |        |                |                |                |                |                |                |                |                |                  |   |
|---------------------------|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|---|
| D/C#                      | Hex    | D7             | D6             | D5             | D4             | D3             | D2             | D1             | D0             | Command          | Description   |
| 0                         | FD     | 1              | 1              | 1              | 1              | 1              | 1              | 0              | 1              | Set Command Lock | A[7:0]: MCU protection status [reset = 12h]<br>A[7:0] = 12h, Unlock OLED driver IC MCU interface from entering command [reset]<br>A[7:0] = 16h, Lock OLED driver IC MCU interface from entering command |
| 1                         | A[7:0] | A <sub>7</sub> | A <sub>6</sub> | A <sub>5</sub> | A <sub>4</sub> | A <sub>3</sub> | A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> |                  | <b>Note</b><br><sup>(1)</sup> The locked OLED driver IC MCU interface prohibits all commands and memory access except the FDh command.  |

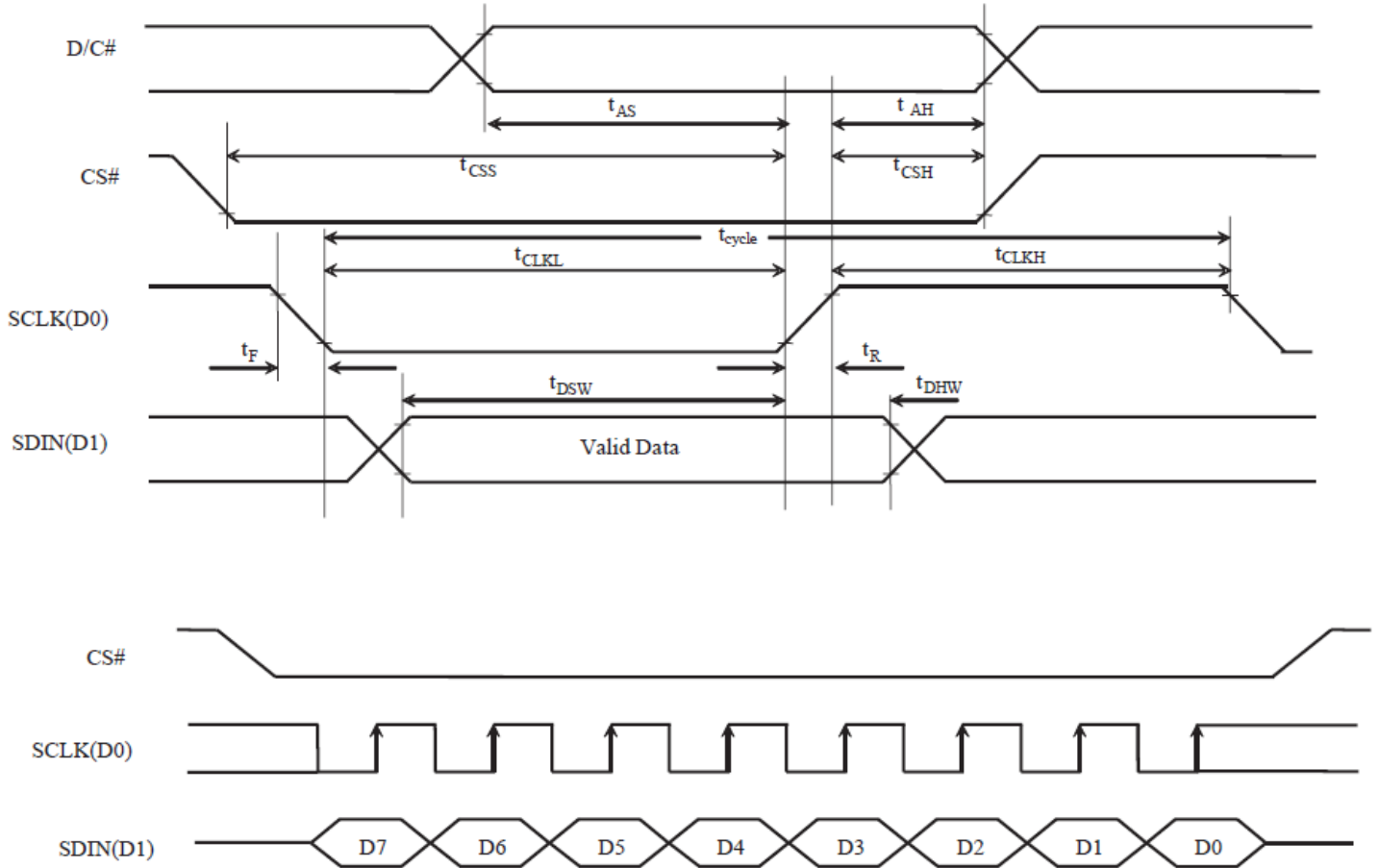
| Graphic acceleration command |        |                |                |                |                |                |                |                |                |                   |   |
|------------------------------|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-------------------|---|
| D/C#                         | Hex    | D7             | D6             | D5             | D4             | D3             | D2             | D1             | D0             | Command           | Description   |
| 0                            | 96     | 1              | 0              | 0              | 1              | 0              | 1              | 1              | 0              | Horizontal Scroll | A[7:0] = 00000000b No scrolling<br>A[7:0] = 00000001b to 00111111b<br>Scroll towards SEG127 with 1 column offset                    |
| 1                            | A[7:0] | A <sub>7</sub> | A <sub>6</sub> | A <sub>5</sub> | A <sub>4</sub> | A <sub>3</sub> | A <sub>2</sub> | A <sub>1</sub> | A <sub>0</sub> |                   | A[7:0] = 01000000b to 11111111b<br>Scroll towards SEG0 with 1 column offset   |
| 1                            | B[6:0] | 0              | B <sub>6</sub> | B <sub>5</sub> | B <sub>4</sub> | B <sub>3</sub> | B <sub>2</sub> | B <sub>1</sub> | B <sub>0</sub> |                   | B[6:0] : start row address  |
| 1                            | C[7:0] | 0              | C <sub>6</sub> | C <sub>5</sub> | C <sub>4</sub> | C <sub>3</sub> | C <sub>2</sub> | C <sub>1</sub> | C <sub>0</sub> |                   | C[7:0] : end row address  |
| 1                            | D[6:0] | 0              | D <sub>6</sub> | D <sub>5</sub> | D <sub>4</sub> | D <sub>3</sub> | D <sub>2</sub> | D <sub>1</sub> | D <sub>0</sub> |                   | D[6:0] : Reserved (reset=00h)   |
| 1                            | E[1:0] | 0              | 0              | 0              | 0              | 0              | 0              | E <sub>1</sub> | E <sub>0</sub> |                   | E[1:0] : scrolling time interval<br>00b Invalid<br>01b normal<br>10b slow<br>11b slowest  |
| 0                            | 9E     | 1              | 0              | 0              | 1              | 1              | 1              | 1              | 0              | Stop Moving       | Stop horizontal scroll<br><b>Note</b><br>After sending 9Eh command to stop the scrolling action, the ram data needs to be rewritten |
| 0                            | 9F     | 1              | 0              | 0              | 1              | 1              | 1              | 1              | 1              | Start Moving      | Start horizontal scroll   |

# Timing Characteristics

## 4-wire SPI:

| Symbol      | Parameter              | Min | Typ | Max | Unit |
|-------------|------------------------|-----|-----|-----|------|
| $t_{cycle}$ | Clock Cycle Time       | 100 | -   | -   | ns   |
| $t_{AS}$    | Address Setup Time     | 15  | -   | -   | ns   |
| $t_{AH}$    | Address Hold Time      | 42  | -   | -   | ns   |
| $t_{CSS}$   | Chip Select Setup Time | 20  | -   | -   | ns   |
| $t_{CSH}$   | Chip Select Hold Time  | 10  | -   | -   | ns   |
| $t_{DSW}$   | Write Data Setup Time  | 15  | -   | -   | ns   |
| $t_{DHW}$   | Write Data Hold Time   | 20  | -   | -   | ns   |
| $t_{CLKL}$  | Clock Low Time         | 20  | -   | -   | ns   |
| $t_{CLKH}$  | Clock High Time        | 20  | -   | -   | ns   |
| $t_R$       | Rise Time              | -   | -   | 15  | ns   |
| $t_F$       | Fall Time              | -   | -   | 15  | ns   |

Figure 9-3 : Serial interface characteristics (4-wire SPI)



## Example Initialization Sequence:

```
void OLED_Init_6464RGB(void)
{
  GPIO_ResetBits(RES_pin);
  delay_ms(300);
  GPIO_SetBits(RES_pin);
  delay_ms(10);

  oled_Command_6464RGB(0xFD); //Command Unlock
  oled_Data_6464RGB(0x12);

  oled_Command_6464RGB(0xAE); //Set Display OFF

  oled_Command_6464RGB(0xB3); //Set Display Clock Divide Ratio/Oscillator Frequency
  oled_Data_6464RGB(0xB0);

  oled_Command_6464RGB(0xCA); //Set MUX Ratio
  oled_Data_6464RGB(0x3F);

  oled_Command_6464RGB(0xA2); //Set Display Offset
  oled_Data_6464RGB(0x40);

  oled_Command_6464RGB(0xA1); //Set Display Start Line
  oled_Data_6464RGB(0x00);

  oled_Command_6464RGB(0xA0); //Set Re-map & Color Depth
  oled_Data_6464RGB(0x70);
  oled_Data_6464RGB(0x00);

  oled_Command_6464RGB(0xC1); //Set Contrast Current
  oled_Data_6464RGB(0x88);
  oled_Data_6464RGB(0x32);
  oled_Data_6464RGB(0x88);

  oled_Command_6464RGB(0xC7); //Master Contrast Current Control
  oled_Data_6464RGB(0x0F);

  oled_Command_6464RGB(0xB1); //Set Phase Length
  oled_Data_6464RGB(0x32);

  oled_Command_6464RGB(0xB6); //Set Second Pre-charge Period
  oled_Data_6464RGB(0x01);

  oled_Command_6464RGB(0xB8); //Gamma Look-up Table
  oled_Data_6464RGB(0x02);
  oled_Data_6464RGB(0x03);
  oled_Data_6464RGB(0x04);
  oled_Data_6464RGB(0x05);
  oled_Data_6464RGB(0x06);
  oled_Data_6464RGB(0x07);
  oled_Data_6464RGB(0x08);
  oled_Data_6464RGB(0x09);
  oled_Data_6464RGB(0x0A);
  oled_Data_6464RGB(0x0B);
```

oled\_Data\_6464RGB(0x0C);  
oled\_Data\_6464RGB(0x0D);  
oled\_Data\_6464RGB(0x0E);  
oled\_Data\_6464RGB(0x0F);  
oled\_Data\_6464RGB(0x10);  
oled\_Data\_6464RGB(0x11);  
oled\_Data\_6464RGB(0x12);  
oled\_Data\_6464RGB(0x13);  
oled\_Data\_6464RGB(0x15);  
oled\_Data\_6464RGB(0x17);  
oled\_Data\_6464RGB(0x19);  
oled\_Data\_6464RGB(0x1B);  
oled\_Data\_6464RGB(0x1D);  
oled\_Data\_6464RGB(0x1F);  
oled\_Data\_6464RGB(0x21);  
oled\_Data\_6464RGB(0x23);  
oled\_Data\_6464RGB(0x25);  
oled\_Data\_6464RGB(0x27);  
oled\_Data\_6464RGB(0x2A);  
oled\_Data\_6464RGB(0x2D);  
oled\_Data\_6464RGB(0x30);  
oled\_Data\_6464RGB(0x33);  
oled\_Data\_6464RGB(0x36);  
oled\_Data\_6464RGB(0x39);  
oled\_Data\_6464RGB(0x3C);  
oled\_Data\_6464RGB(0x3F);  
oled\_Data\_6464RGB(0x42);  
oled\_Data\_6464RGB(0x45);  
oled\_Data\_6464RGB(0x48);  
oled\_Data\_6464RGB(0x4C);  
oled\_Data\_6464RGB(0x50);  
oled\_Data\_6464RGB(0x54);  
oled\_Data\_6464RGB(0x58);  
oled\_Data\_6464RGB(0x5C);  
oled\_Data\_6464RGB(0x60);  
oled\_Data\_6464RGB(0x64);  
oled\_Data\_6464RGB(0x68);  
oled\_Data\_6464RGB(0x6C);  
oled\_Data\_6464RGB(0x70);  
oled\_Data\_6464RGB(0x74);  
oled\_Data\_6464RGB(0x78);  
oled\_Data\_6464RGB(0x7D);  
oled\_Data\_6464RGB(0x82);  
oled\_Data\_6464RGB(0x87);  
oled\_Data\_6464RGB(0x8C);  
oled\_Data\_6464RGB(0x91);  
oled\_Data\_6464RGB(0x96);  
oled\_Data\_6464RGB(0x9B);  
oled\_Data\_6464RGB(0xA0);  
oled\_Data\_6464RGB(0xA5);  
oled\_Data\_6464RGB(0xAA);  
oled\_Data\_6464RGB(0xAF);  
oled\_Data\_6464RGB(0xB4);

```
oled_Command_6464RGB(0xBB); //Set Pre-charge Voltage
oled_Data_6464RGB(0x17);

oled_Command_6464RGB(0xBE); //Set VCOMH
oled_Data_6464RGB(0x05);

oled_Command_6464RGB(0x15); //Set Column Address
oled_Data_6464RGB(0x20);
oled_Data_6464RGB(0x5F);

oled_Command_6464RGB(0x75); //Set Row Address
oled_Data_6464RGB(0x00);
oled_Data_6464RGB(0x3F);

oled_Command_6464RGB(0xA6); //Set Display Mode

oled_Clear_Screen();           //Clear Display (write all 0x00's to display RAM)

oled_Command_6464RGB(0xAF); //Set Display ON

oled_Command_6464RGB(0x5C); //Enable Write Data into RAM
}
```



## Quality Information

| Test Item                             | Content of Test  | Test Condition   | Note |
|---------------------------------------|--|--|------|
| High Temperature storage              | Test the endurance of the display at high storage temperature.   | +85°C, 240 Hrs.  | 2    |
| Low Temperature storage               | Test the endurance of the display at low storage temperature.  | -40°C, 240 Hrs.  | 1,2  |
| High Temperature Operation            | Test the endurance of the display by applying electric stress (voltage & current) at high temperature.                         | +70°C, 240 Hrs.  | 2    |
| Low Temperature Operation             | Test the endurance of the display by applying electric stress (voltage & current) at low temperature.                          | -40°C, 240 Hrs.  | 1,2  |
| High Temperature / Humidity Operation | Test the endurance of the display by applying electric stress (voltage & current) at high temperature with high humidity.      | +60°C, 90% RH, 120 Hrs.  | 1,2  |
| Thermal Shock resistance              | Test the endurance of the display by applying electric stress (voltage & current) during a cycle of low and high temperatures. | -40°C, 30 min -> 25°C, 5 min -> 70°C, 30 min = 1 cycle<br>100 Cycles               |      |
| Vibration test                        | Test the endurance of the display by applying vibration to simulate transportation and use.                                    | 10-22Hz , 15mm amplitude.<br>22-500Hz, 1.5G<br>30min in each of 3 directions X,Y,Z | 3    |
| Atmospheric Pressure test             | Test the endurance of the display by applying atmospheric pressure to simulate transportation by air.                          | 115mbar, 40hrs   | 3    |
| Static electricity test               | Test the endurance of the display by applying electric static discharge.   | V <sub>s</sub> =800V, R <sub>s</sub> =1.5kΩ, C <sub>s</sub> =100pF<br>One time     |      |

**Note 1:** No condensation to be observed.

**Note 2:** Conducted after 2 hours of storage at 25°C, 0%RH.

**Note 3:** Test performed on product itself, not inside a container.

### Evaluation Criteria:

- 1: Display is fully functional during operational tests and after all tests, at room temperature.
- 2: No observable defects.
- 3: Luminance >50% of initial value.
- 4: Current consumption within 50% of initial value

## Precautions for using OLEDs/LCDs/LCMs

See Precautions at [www.newhavendisplay.com/specs/precautions.pdf](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information

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