深圳市拓普微科技开发有限公司
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# LM192160FCW

LCD Module User Manual

| Prepared by: | Checked by: | Approved by: |
|---|---|---|
| **Lin** | | |
| Date: 2011-09-21 | Date: | Date: |

| Rev. | Descriptions | Release Date |
|---|---|---|
| 0.1 | Preliminary release | 2011-3-29 |
| 0.2 | Refine /WR, /RD description | 2011-09-21 |
| | | |
| | | |
| | | |

# Table of Content

# 1. Basic Specifications

## 1.1 Display Specifications

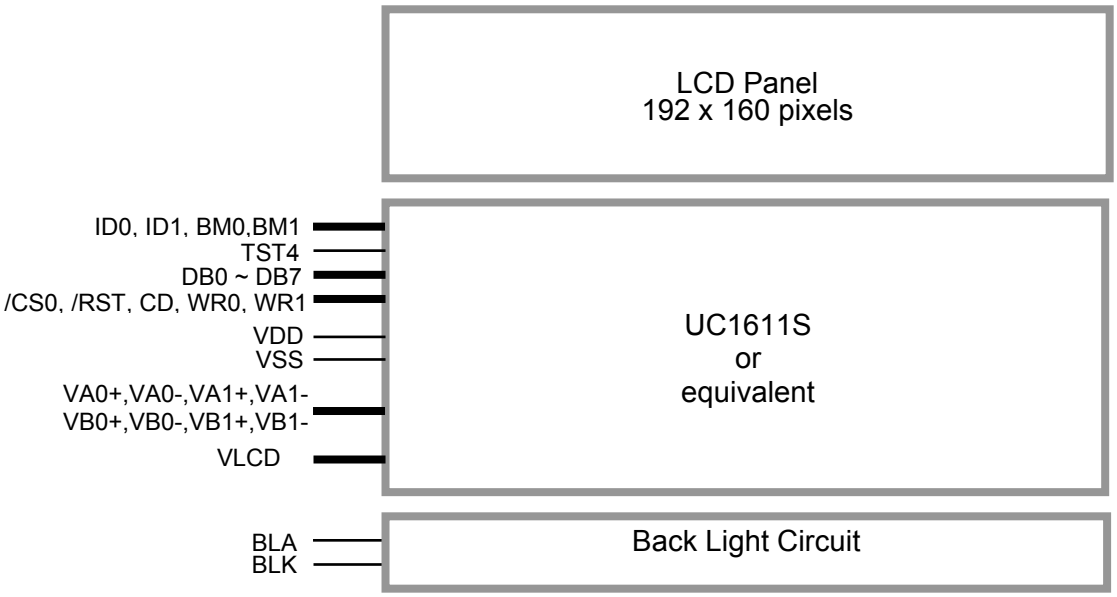
1) LCD Display Mode : FSTN, Positive, Transflective
2) Display Color : Display Data = “1” : Light Gray (*1)
: Display Data = “0” : Dark Blue (*2)
3) Viewing Angle : 6H
4) Driving Method : 1/160 duty, 1/10 bias
5) Back Light : White LED backlight

Note:
*1. Color tone may slightly change by Temperature and Driving Condition.
*2. The Color is defined as the inactive / background color

## 1.2 Mechanical Specifications

1) Outline Dimension : 100.65 x 84.8 x 11.5
(See attached Outline Drawing for details)

## 1.3 Block Diagram



### 1.4 Terminal Functions

| Pin No. | Pin Name | I/O | Descriptions | | |
|---|---|---|---|---|---|
| | | | 8-bit parallel 8080 mode | 8-bit parallel 6800 mode | Serial mode 4Line |
| 1 | VSS2 | Power | Connect to VSS | | |
| 2 | VSS2 | Power | Connect to VSS | | |
| 3 | DB7 | I/O | 8-bit Data bus;<br>Three state I/O terminal for display data or instruction data<br>when /CS =H,<br>DB0~DB7=High Impedance | | Not use, Connect to VSS |
| : | : | | | | |
| 7 | DB3(SDA) | | | | Serial data input(DB3) |
| : | : | | | | Not use, Connect to VSS |
| 10 | DB0(SCL) | | | | Serial clock input(DB0) |
| 11 | /RST | Input | Reset:<br>/RST=LOW: Initialization is executed<br>/RST=HIGH: Normal | | |
| 12 | /CS0 | Input | Chip Select<br>/CS0=LOW : Data IO is enabled | | |
| 13 | CD | Input | Register Select<br>CD=HIGH: data on DB0 to DB7 is display data<br>CD=LOW: data on DB0 to DB7 is control data | | |
| 14 | WR0 | Input | WR0=L→H, WR1=H;<br>Data or Instruction latch into the LCD module<br>WR0=H, WR1=L;<br>Data or Status read form the LCD module | WR0=H,WR1=H;<br>Data or Status read from the LCD module<br>WR0=L,WR1=H→L;<br>Data or Status latch into the LCD module | Not used,<br>Connect to VSS |
| 15 | WR1 | Input | | | |
| 16 | BM1 | Input | H | H | H |
| 17 | BM0 | Input | L | H | L |
| 18 | TST4 | - | Not use(Leave open) | | |
| 19 | ID0 | Input | Production control. The connection will a ffect the content of ID when using the Get Status command. Connect to VDD for ”H” or VSS for “L” | | |
| 20 | ID1 | Input | SEG selection. Window commands will adjust its upper bound of column accordingly.<br>0 : number of column is set to 256 (SEG0~255)<br>1 : use SEG0~239 only and leave SEG240~255 open. | | |
| 21 | VSS | Power | 0V Supply, Ground (0V) | | |
| 22 | VDD | Power | Positive Power Supply | | |
| 23 | VLCD | Power | High voltage LCD Power Supply | | |
| 24 | VA0- | Power | LCD driving voltage supply terminals | | |
| 25 | VA1- | | | | |
| 26 | VA1+ | | | | |
| 27 | VA0+ | | | | |
| 28 | VB0- | | | | |
| 29 | VB1- | | | | |
| 30 | VB1+ | | | | |
| 31 | VB0+ | | | | |
| 32 | VSS2 | Power | Connect to VSS | | |
| / | BLA | Power | Backlight Positive Power Supply | | |
| / | BLK | Power | Backlight Negative Power Supply | | |

Note: About Interface setting, please refer to UC1611 datasheet for more detail.

# 2. Absolute Maximum Ratings

| Items | Symbol | Min. | Max. | Unit | Condition |
|---|---|---|---|---|---|
| Supply Voltage | $V_{DD}$ | -0.3 | +4.0 | V | $V_{SS}$ = 0V |
| Input Voltage | $V_{IN}$ | -0.3 | $V_{DD}$+0.3 | V | $V_{SS}$ = 0V |
| Operating Temperature | $T_{OP}$ | -25 | +70 | °C | No Condensation |
| Storage Temperature | $T_{ST}$ | -35 | +80 | °C | No Condensation |

Cautions:
Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

# 3. Electrical Characteristics

## 3.1 DC Characteristics

$V_{SS}$=0V, $V_{DD}$=3.3V, $T_{OP}$=25°C

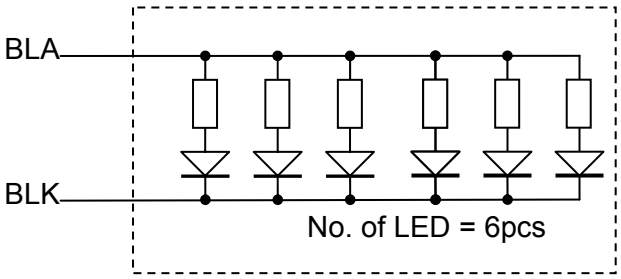
| Items | Symbol | MIN. | TYP. | MAX. | Unit | Condition / Application Pin |
|---|---|---|---|---|---|---|
| Operating Voltage | $V_{DD}$ | 3.0 | 3.3 | 3.6 | V | VDD |
| Input High Voltage | $V_{IH}$ | 0.8x$V_{DD}$ | - | $V_{DD}$ | V | /RST, /CS0, CD, WR0, WR1, DB0~DB7 |
| Input Low Voltage | $V_{IL}$ | 0 | - | 0.2x$V_{DD}$ | V | |
| Operating Current | $I_{DD}$ | - | 1.4 | 3.5 | mA | VDD |

## 3.2 LED Backlight Circuit Characteristics

$V_{SS}$=0V, $If_{BLA}$=102mA, $T_{OP}$=25°C

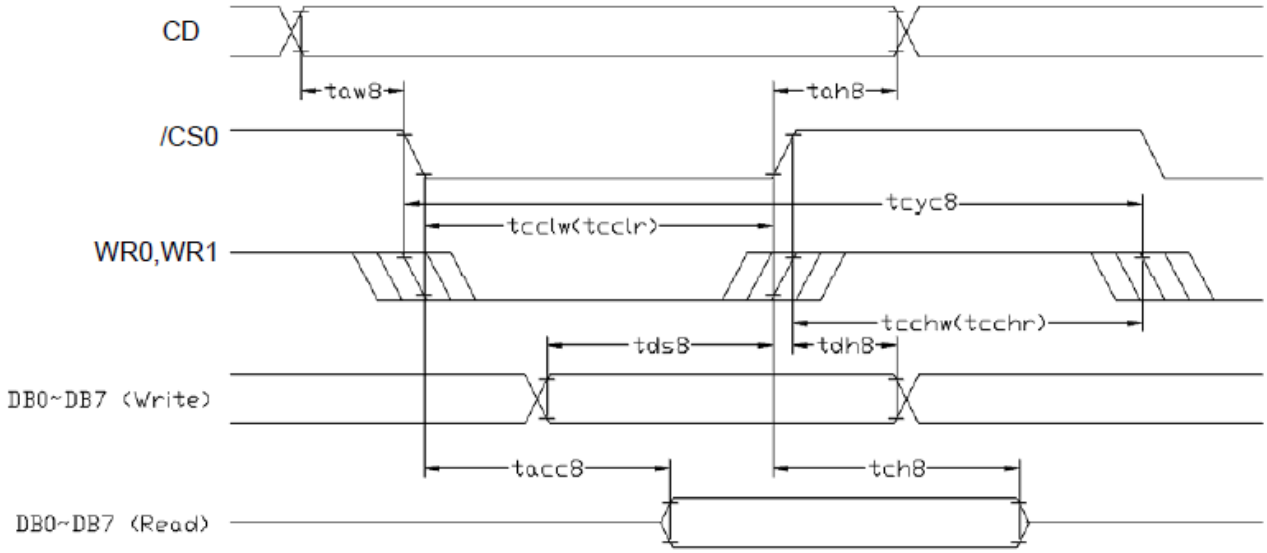
| Items | Symbol | MIN. | TYP. | MAX. | Unit | Applicable Pin |
|---|---|---|---|---|---|---|
| Forward Voltage | $Vf_{BLA}$ | - | 5.0 | - | V | BLA |
| Forward Current | $If_{BLA}$ | - | 102 | 120 | mA | BLA |

Cautions:
Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



## 3.3 AC Characteristics

### 3.3.1 8080 Mode System Bus Timing

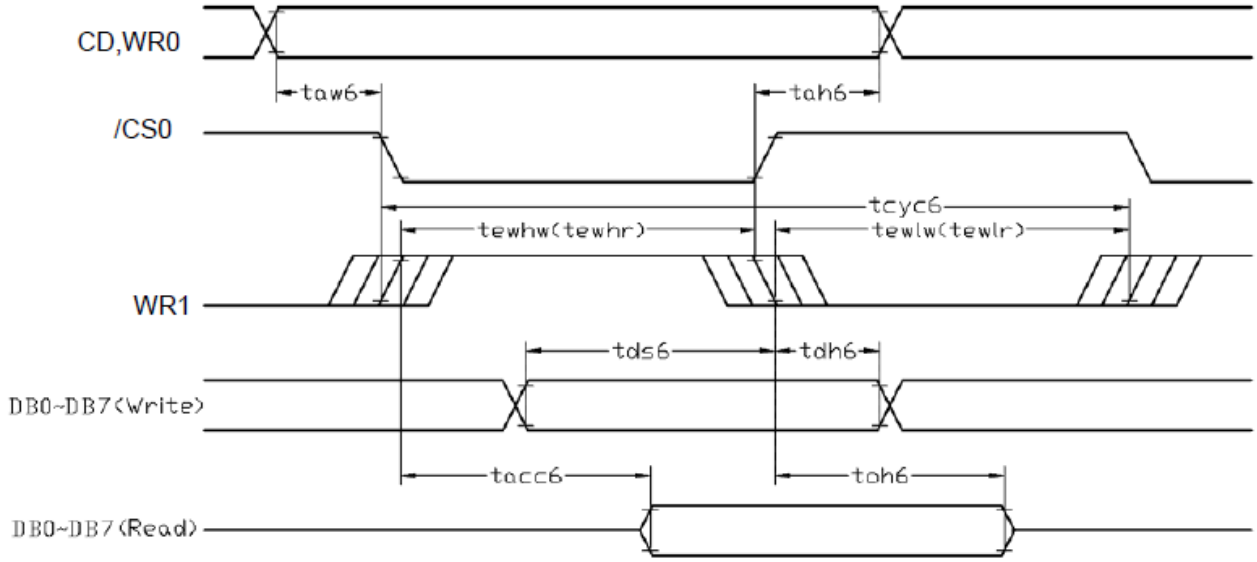



$V_{SS}$=0V, $V_{DD}$=3.3V, $T_{OP}$=25°C

| Item | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| System cycle time | tcyc8 | 185 | - | - | ns |
| Address setup time (CD) | taw8 | 10 | - | - | ns |
| Address hold time (CD) | tah8 | 10 | - | - | ns |
| Control LOW pulse width (WR0) | tcclw | 93 | - | - | ns |
| Control LOW pulse width (WR1) | tcclr | 93 | - | - | ns |
| Control HIGH pulse width (WR0) | tcchw | 93 | - | - | ns |
| Control HIGH pulse width (WR1) | tcchr | 93 | - | - | ns |
| Data setup time | tds8 | 43 | - | - | ns |
| Data hold time | tdh8 | 10 | - | - | ns |
| WR1 access time (*2) | tacc8 | - | - | 85 | ns |
| Output disable time (*2) | tch8 | 21 | - | - | ns |

Note:
*1. Input signal rise/fall time should be less than 12ns
*2. CL=100pF

### 3.3.2 6800 Mode System Bus Timing

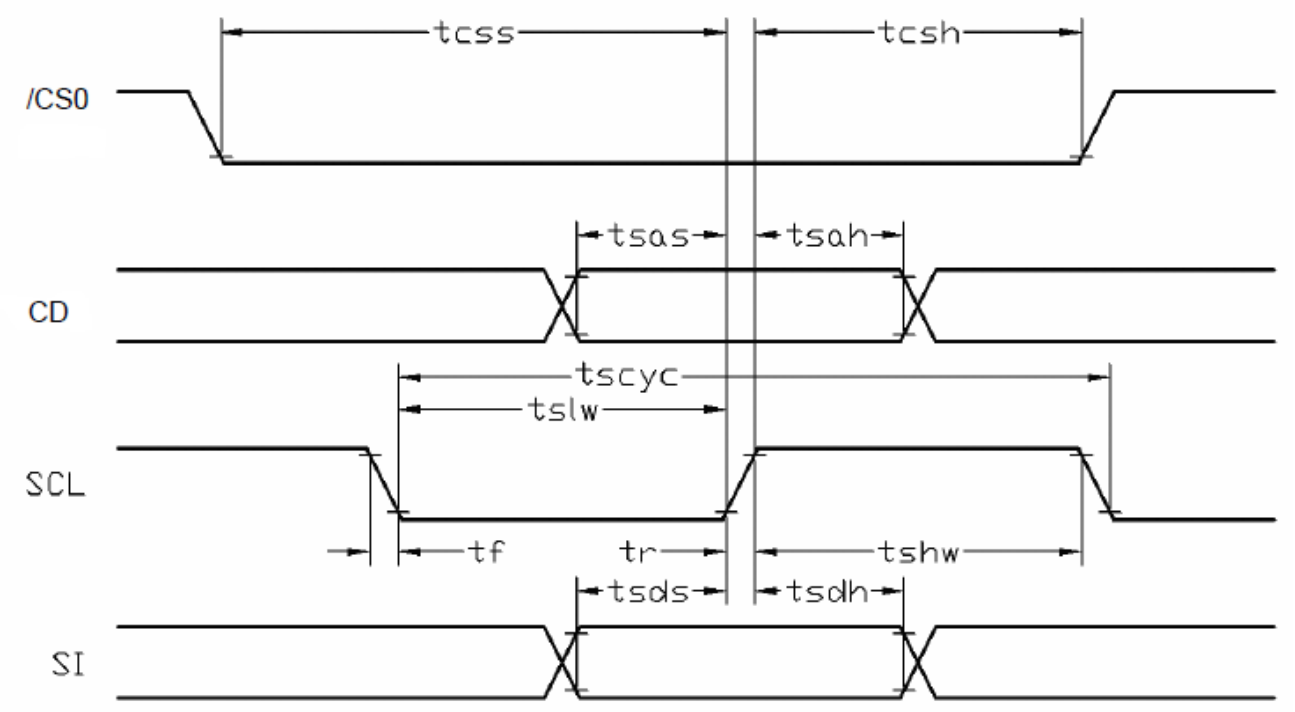



$V_{SS}$=0V, $V_{DD}$=3.3V, $T_{OP}$=25°C

| Item | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| System cycle time | tcyc6 | 185 | - | - | ns |
| Address setup time (CD) | taw6 | 10 | - | - | ns |
| Address hold time (CD) | tah6 | 10 | - | - | ns |
| Control LOW pulse width (WR0) | tewlr | 93 | - | - | ns |
| Control LOW pulse width (WR0) | tewlw | 93 | - | - | ns |
| Control HIGH pulse width (WR1) | tewhr | 93 | - | - | ns |
| Control HIGH pulse width (WR0) | tewhw | 93 | - | - | ns |
| Data setup time | tds6 | 43 | - | - | ns |
| Data hold time | tdh6 | 10 | - | - | ns |
| WR1 access time (*2) | tacc6 | - | - | 85 | ns |
| Output disable time (*2) | toh6 | 21 | - | - | ns |

Note:
*1. Input signal rise/fall time should be less than 12ns
*2. CL=100pF

### 3.3.3 Serial Mode Interface

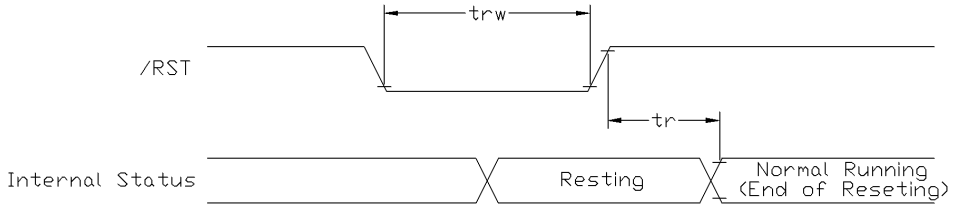



$V_{SS}$=0V, $V_{DD}$=3.3V, $T_{OP}$=25°C

| Item | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Serial Clock Period | tscyc | 51 | - | - | ns |
| Address setup time (CD) | tsas | 10 | - | - | ns |
| Address hold time (CD) | tsah | 10 | - | - | ns |
| SCL “H” pulse width | tshw | 26 | - | - | ns |
| SCL “L” pulse width | tslw | 26 | - | - | ns |
| Data setup time | tsds | 21 | - | - | ns |
| Data hold time | tsdh | 10 | - | - | ns |
| CS-SCL time | tcss | 10 | - | - | ns |
| CS-SCL time | tcsh | 10 | - | - | ns |

Note:
*1. Input signal rise/fall time should be less than 12ns

### 3.4 Reset Timing



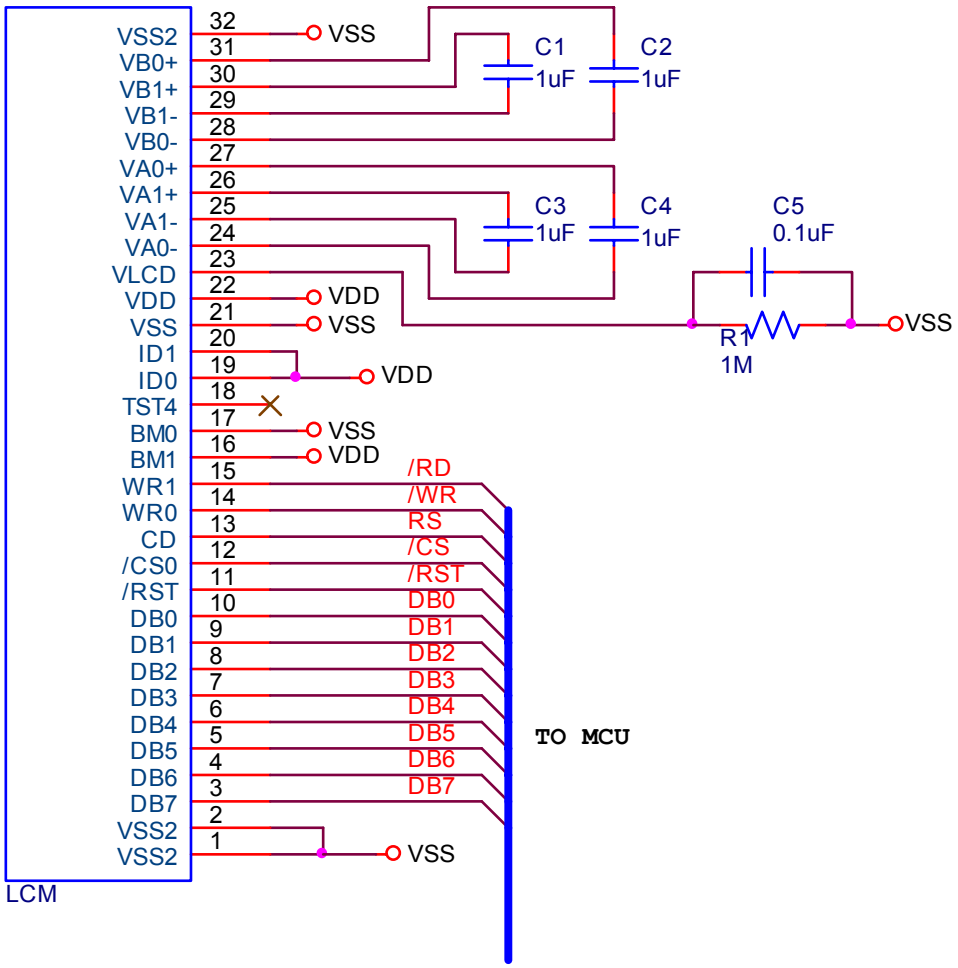

$V_{SS}$=0V, $V_{DD}$=3.3V, $T_{OP}$=25°C

| Item | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| Reset time | tr | - | - | 15 | ms |
| Reset LOW pulse width | trw | 4 | - | - | μs |

Note:
*1. Input signal rise/fall time should be less than 12ns

# 4. Function Specifications

## 4.1 Application circuit (Example)

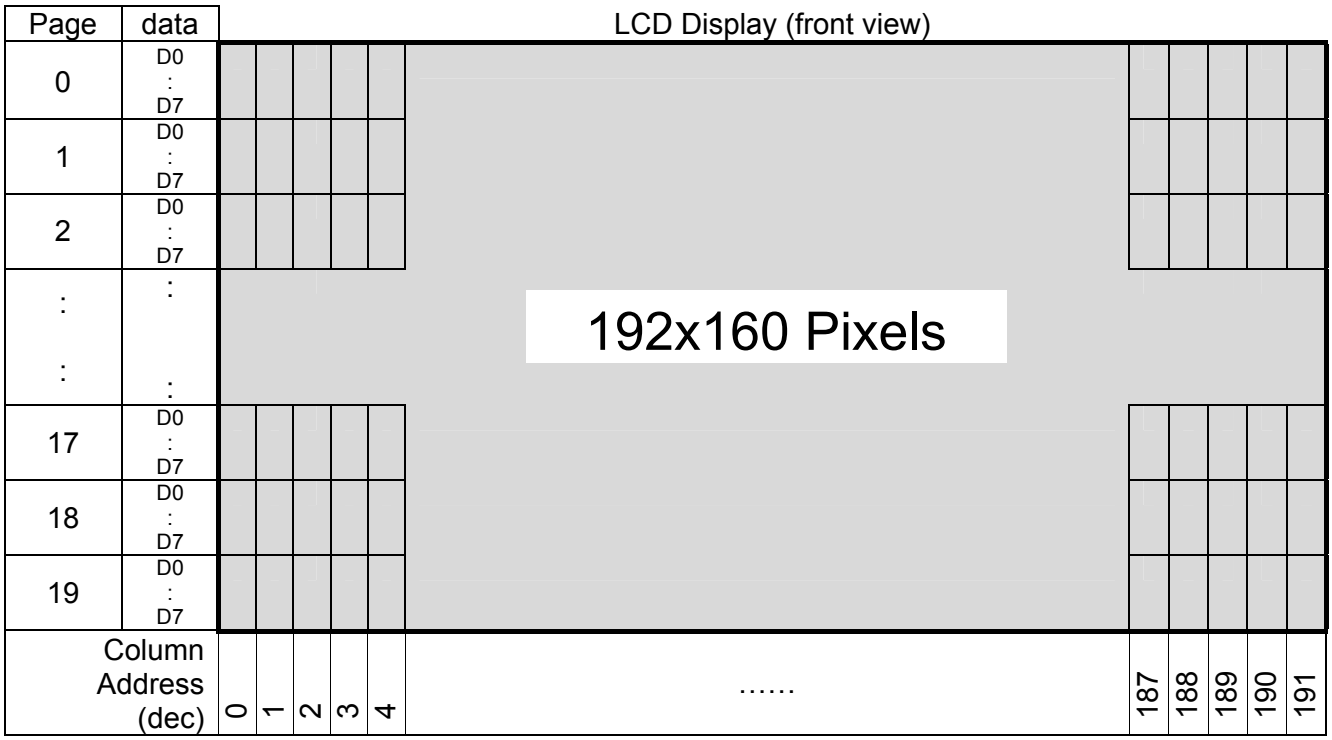



NOTE: 8080 mode (Default setting), please refer to UC1611 datasheet for details.

## 4.2 Resetting the LCD module

The LCD module should be initialized by using /RST terminal.
While turning on the VDD and VSS power supply, maintain /RST terminal at LOW level. After the power supply stabilized, release the reset terminal (/RST=HIGH)

### 4.3 Display Memory Map




Pixel mapping (Top View)

Note:

*1. Based on the top view of the LCD module,

*2. The above is memory map based on:

On/Off mode setting, DC[5:3]=100 (1bpp),the Page value range:**0**～**19**

LC[0]=MSF=0

LC[1]=MX=1

LC[2]=MY=0

SL=0

*3. For 4,8 and 16 Gray-shade operation please refer to UC1611 datasheet.

## 4.4 Commands

### 4.4.1 Register Table

| Name | Bits | Default | Description |
|---|---|---|---|
| SL | 8 | 00H | Scroll Line. Scroll the displayed image up by SL rows. The valid SL value are between 0 (for no scrolling) and (159 – FL). Setting SL outside of this range causes undefined effect on the displayed image. |
| FL | 4 | 0H | Fixed lines. The first (FLx2) lines of each frame are fixed and are not affected by scrolling (SL). When FL is non-zero, the screen is effectively separated into two regions: one scrollable, one non-scrollable. |
| CA | 8 | 00H | Display Data RAM Column Address<br>(Used in Host to Display Data RAM access) |
| PA | 7 | 00H | Display Data RAM Page Address (Used in Host for Display Data RAM access)<br>When DC[5:3] = 100b,<br>PA[6:5] : used to select Write Pattern 0~3.<br>PA[4:0] : set SRAM page address |
| BR | 2 | 2H | Bias Ratio. The ratio between $V_{LCD}$ and $V_{BIAS}$.<br>00b: 5 01b: 10<br>**10b: 11** 11b: 12 |
| TC | 2 | 0H | Temperature Compensation (per °C).<br>**00b: -0.05%** 01b: -0.10%<br>10b: -0.15% 11b: 0.00% |
| PM | 8 | EAH | Electronic Potentiometer to fine tune $V_{BIAS}$ and $V_{LCD}$ |
| PMO | 6 | 00H | PM offset.<br>the effective PM value, PMV = PM - PMO[4:0] when PMO[5]=1<br>the effective PM value, PMV = PM + PMO[4:0] when PMO[5]=0 |
| PC | 4 | FH | Pump Control.<br>PC[1:0]: Panel Loading<br>00b: LCD: ≤33nF **11b: 33nF ≤ LCD≤55nF**<br>PC[3:2]: Pump Control<br>00b: External $V_{LCD}$ **11b: Internal $V_{LCD}$** (11x charge pump)<br>(Setting to 01 or 10 will be invalid and default value will be used instead.) |
| AC | 4 | 1H | Address Control:<br>AC[0]: WA: Automatic column/page Wrap Around (Default **1:ON**)<br>AC[1]: Auto-Increment order<br>**0: Column (CA) first** 1: Page (PA) first<br>AC[2]: PID: PA (page address) auto increment direction (**0:+1**, 1:-1)<br>AC[3]: Window Program Mode<br>**0 : Inside Mode:** Write to SRAM within the window defined by (WPC0,WPP0), (WPC1,WPP1)<br>1 : Outside Mode: Write to SRAM but skip the window defined by (WPC0,WPP0), (WPC1,WPP1) |

**Register Table (continue)**

<table>
<tr><th>Name</th><th>Bits</th><th>Default</th><th>Description</th></tr>
<tr><td>DC</td><td>8</td><td>18H</td><td>Display Control:<br>DC[0]: PXV: Pixels Inverse. Bit-wise data inversion. (Default 0:OFF)<br>DC[1]: APO: All Pixels ON (Default 0:OFF)<br>DC[2]: Display ON/OFF (Default 0:OFF)<br>DC[4:3]: Gray-shade Modulation mode.<br>00 : On/Off mode 01: 8-shade Mode<br>10 : 4-shade Mode 11: 16-shade mode<br>DC[5]: Input Type of On/Off Mode (enable only when DC[4:3]=00b)<br>0: 4-bit per 1-pixel 1: 1-bit per 1-pixel<br>DC[7:6]: Display Pattern Selection (enable only when DC[5:3]=100b)<br>00: Pattern0 01: Pattern1<br>10: Pattern2 11: Pattern3</td></tr>
<tr><td>LC</td><td>10</td><td>020H</td><td>LCD Control:<br>LC[0]: MSF: MSB First mapping Option (Default: 0:OFF)<br>LC[1]: MX, Mirror X. SEG/Column sequence inversion (Default: 0:OFF)<br>LC[2]: MY, Mirror Y. COM/Row sequence inversion (Default: 0:OFF)<br>LC[3]: Enable FL lines in partial display mode.(Default: 0:OFF)<br>LC[5:4]: Line Rate (= Frame-Rate x Mux-Rate)
<table>
<tr><td></td><td>LC[5:4]=00b</td><td>01b</td><td>10b</td><td>11b</td></tr>
<tr><td>16-shade</td><td>20.0 Klps</td><td>24.0</td><td>28.0</td><td>32.0</td></tr>
<tr><td>8-shade</td><td>14.1</td><td>16.9</td><td>19.7</td><td>22.5</td></tr>
<tr><td>4-shade</td><td>13.3</td><td>16.0</td><td>18.7</td><td>21.4</td></tr>
<tr><td>On/Off mode</td><td>5.9</td><td>7.1</td><td>8.2</td><td>9.4</td></tr>
</table>
( Klps: Kilo-Line-per-second )<br>LC[7:6] : Reserved (Default : 00b)<br>LC[9:8] : Partial Display Control<br>0xb: Disable Mux-rate = CEN+1 (DST and DEN are not used.)<br>11b: Enabled Mux-rate = DEN-DST+1+LC[3]xFLx2</td></tr>
<tr><td>NIV</td><td>7</td><td>00H</td><td>N-Line Inversion<br>NIV[5:0] : 000000b : Disable N-line Inversion<br>NIV[6] : 0b: no-XOR 1b: XOR</td></tr>
<tr><td>CEN<br>DST<br>DEN</td><td>8<br>8<br>8</td><td>9FH<br>00H<br>9FH</td><td>COM scanning ENd (the last COM with full line cycle, 0-based index)<br>Display STart (the first COM with active scan pulse, 0-based index)<br>Display EDd (the last COM with active scan pulse, 0-based index)<br>Please maintain the following relationship:<br>CEN = (the actual number of pixel rows on the LCD) – 1<br>CEN ≥ DEN ≥ DST+ 9</td></tr>
<tr><td>ISOF</td><td>4</td><td>1H</td><td>Set the ISOlation clock in Front of COM pulse.</td></tr>
<tr><td>ISOB</td><td>4</td><td>0H</td><td>Set the ISOlation clock in Back of COM pulse.</td></tr>
<tr><td>WPC0</td><td>8</td><td>00H</td><td>Window program starting column address. Value range: 0 ~255.</td></tr>
<tr><td>WPP0</td><td>6</td><td>00H</td><td>Window program starting row address. Value range: 0~79.<br>When DC[5:3]=100b, value range: 0~19</td></tr>
<tr><td>WPC1</td><td>8</td><td>FFH</td><td>Window program ending column address. Value range: 0~255.</td></tr>
<tr><td>WPP1</td><td>6</td><td>4FH</td><td>Window program ending row address. Value range: 0~79.<br>When DC[5:3]=100b, value range: 0~19</td></tr>
</table>

**Register Table (continue)**

| Name | Bits | Default | Description |
|---|---|---|---|
| MTPC | 5 | 10H | MTP Programming Control:<br>MTPC[2:0] : MTP command<br>**000 : Idle** 001 : Read<br>010 : Erase 011 : Program<br>1xx : For UltraChip debug use only<br>MTPC[3] : MTP Enable (automatically cleared after each MTP command)<br>MTPC[4] : Ignore/Use MTP. 0: Ignore **1: Use** |
| MTPM | 6 | 00H | MTP Write Mask..<br>0: no action 1: program |
| APC | 1 | N/A | Advanced Product Configuration. For UltraChip only. Please do not use. |
| **Status Registers** | | | |
| OM | 2 | – | Operating Modes (Read Only)<br>00b: Reset 01b: (Not used)<br>10b: Sleep 11b: Normal |
| MD | 1 | – | MTP option flag.<br>0 : for non-MTP version. 1 : for MTP version |
| MS | 1 | – | MTP programming in-progress |
| WS | 1 | – | MTP Operation Succeeded |

## 4.5 Command Table

The following setting should be issue to LCD module after hardware reset.
(It is an example only; it could be adjusted if necessary.)

| | Command | D/C | W/R | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Action | Default |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Write Data Byte | 1 | 0 | # | # | # | # | # | # | # | # | Write 1 byte | N/A |
| 2. | Read Data Byte | 1 | 1 | # | # | # | # | # | # | # | # | Read 1 byte | N/A |
| 3. | Get Status | 0 | 1 | Ver | MX | MY | WA | DE | WS | MD | MS | Get Status | N/A |
| | | | | ID[1:0] | | PMO[5:0] | | | | | | | |
| | | | | Product Code | | | | 0 | 0 | 0 | EF | | |
| 4. | Set Column Addr. LSB | 0 | 0 | 0 | 0 | 0 | 0 | # | # | # | # | Set CA[3:0] | 0 |
| | Set Column Addr. MSB | 0 | 0 | 0 | 0 | 0 | 1 | # | # | # | # | Set CA[7:4] | 0 |
| 5. | Temp. Compensation. | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | # | # | Set TC[1:0] | 00b: -0.05%/°C |
| 6. | Set Panel Loading | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | # | # | Set PC [1:0] | 11b: 33~55 nF |
| 7. | Set Pump Control | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | # | # | Set PC [3:2] | 11b |
| 8. | Set Adv. Program Control (double-byte command) | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | R | R | Set APC[R][7:0] R = 0~3 | N/A |
| | | | | # | # | # | # | # | # | # | # | | |
| 9. | Set Scroll Line LSB | 0 | 0 | 0 | 1 | 0 | 0 | # | # | # | # | Set SL[3:0] | 0 |
| | Set Scroll Line MSB | | | 0 | 1 | 0 | 1 | # | # | # | # | Set SL[7:4] | 0 |
| 10. | Set Page Address LSB | 0 | 0 | 0 | 1 | 1 | 0 | # | # | # | # | Set PA[3:0] | 0 |
| | Set Page Address MSB | | | 0 | 1 | 1 | 1 | 0 | # | # | # | Set PA[6:4] | 0 |
| 11. | Set Potentiometer (double-byte command) | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Set PM[7:0] | PM=EAH |
| | | | | # | # | # | # | # | # | # | # | | |
| 12. | Set Isolation Clock Front | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Set ISOF[3:0] | 1H |
| | | | | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | | |
| | | | | - | - | - | - | # | # | # | # | | |
| 13. | Set Isolation Clock Back | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Set ISOB[3:0] | 0H |
| | | | | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | | |
| | | | | - | - | - | - | # | # | # | # | | |
| 14. | Set Partial Display Control | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | # | # | Set LC[9:8] | 00b: Disable |
| 15. | Set RAM Address Control | 0 | 0 | 1 | 0 | 0 | 0 | 1 | # | # | # | Set AC[2:0] | 001b |
| 16. | Set Fixed Lines | 0 | 0 | 1 | 0 | 0 | 1 | # | # | # | # | Set FL[3:0] | 0 |
| 17. | Set Line Rate | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | # | # | Set LC[5:4] | 10b:28klps |
| 18. | Set All-Pixel-ON | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | # | Set DC[1] | 0 |
| 19. | Set Inverse Display | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | # | Set DC[0] | 0 |
| 20. | Set Display Enable | 0 | 0 | 1 | 0 | 1 | 0 | 1 | # | # | # | Set DC[4:2] | 110b |
| 21. | Set LCD Mapping Control (double-byte command) | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | Set LC[3:0] | 0 |
| | | | | 0 | 0 | 0 | 0 | # | # | # | # | | |
| 22. | Set N-line Inversion (double-byte command) | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | Set NIV[6:0] | 00H |
| | | | | - | # | # | # | # | # | # | # | | |
| 23. | Set Display Pattern | 0 | 0 | 1 | 1 | 0 | 1 | 0 | # | # | # | Set DC[7:5] | 000b |
| 24. | System Reset | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | System Reset | N/A |
| 25. | NOP | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | No operation | N/A |
| 26. | Set test control (double-byte command) | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | TT | | For testing only. Do not use. | N/A |
| | | 0 | 0 | # | # | # | # | # | # | # | # | | |
| 27. | Set LCD Bias Ratio | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | # | # | Set BR[1:0] | 10b: 11 |
| 28. | Set COM End | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | Set CEN[7:0] | 159 |
| | | 0 | 0 | # | # | # | # | # | # | # | # | | |
| 29. | Set Partial Display Start | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | Set DST[7:0] | 0 |
| | | 0 | 0 | # | # | # | # | # | # | # | # | | |
| 30. | Set Partial Display End | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | Set DEN[7:0] | 159 |
| | | 0 | 0 | # | # | # | # | # | # | # | # | | |

Note:
Please refer to UC1611 data sheet for details
R/W=0 means it is a write function, R/W=1 means it is a read function
D/C=0 means it is a control data, D/C=1 means it is a display data

Design and Handling Precaution

1. The LCD panel is made by glass. Any mechanical shock (eg. dropping form high place) will damage the LCD module.
2. Do not add excessive force on the surface of the display, which may cause the Display color change abnormally.
3. The polarizer on the LCD is easily get scratched. If possible, do not remove the LCD protective film until the last step of installation.
4. Never attempt to disassemble or rework the LCD module.
5. Only Clean the LCD with Isopropyl Alcohol or Ethyl Alcohol. Other solvents (eg. water) may damage the LCD.
6. When mounting the LCD module, make sure that it is free form twisting, warping and distortion.
7. Ensure to provide enough space (with cushion) between case and LCD panel to prevent external force adding on it, or it may cause damage to the LCD or degrade the display result.
8. Only hold the LCD module by its side. Never hold LCD module by add force on the heat seal or TAB.
9. Never add force to component of the LCD module. It may cause invisible damage or degrade of the reliability.
10. LCD module could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect the LCD module.
11. When peeling off the protective film from LCD, static charge may cause abnormal display pattern. It is normal and will resume to normal in a short while.
12. Take care and prevent get hurt by the LCD panel sharp edge.
13. Never operate the LCD module exceed the absolute maximum ratings.
14. Keep the signal line as short as possible to prevent noisy signal applying to LCD module.
15. Never apply signal to the LCD module without power supply.
16. IC chip (eg. TAB or COG) is sensitive to the light. Strong lighting environment could possibly cause malfunction. Light sealing structure casing is recommend.
17. LCD module reliability may be reduced by temperature shock.
18. When storing the LCD module, avoid exposure to the direct sunlight, high humidity, high temperature or low temperature. They may damage or degrade the LCD module