ELEG3924 Microprocessor

LCD Display

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LCD

- **LCD display**
  - Model number: DMC-20481
  - Manufacturer: Optrex (one of the largest manufacturer of LCD)
  - 16 pins, we only use pins 1 ~ 14
    - Vcc: 5V, Vss: ground, Vee: ground (control display contrast)
    - E=1: enable; E=0: disable
    - R/W=1: read, R/W=0: write
    - RS=0: read or write command
    - RS=1: read or write data

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>I/O</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VSS</td>
<td>--</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>VCC</td>
<td>--</td>
<td>+5V power supply</td>
</tr>
<tr>
<td>3</td>
<td>VEE</td>
<td>--</td>
<td>Power supply to control contrast</td>
</tr>
<tr>
<td>4</td>
<td>RS</td>
<td>I</td>
<td>RS = 0 to select command register, RS = 1 to select data register</td>
</tr>
<tr>
<td>5</td>
<td>R/W</td>
<td>I</td>
<td>R/W = 0 for write, R/W = 1 for read</td>
</tr>
<tr>
<td>6</td>
<td>E</td>
<td>I/O</td>
<td>Enable</td>
</tr>
<tr>
<td>7</td>
<td>DB0</td>
<td>I/O</td>
<td>The 8-bit data bus</td>
</tr>
<tr>
<td>8</td>
<td>DB1</td>
<td>I/O</td>
<td>The 8-bit data bus</td>
</tr>
<tr>
<td>9</td>
<td>DB2</td>
<td>I/O</td>
<td>The 8-bit data bus</td>
</tr>
<tr>
<td>10</td>
<td>DB3</td>
<td>I/O</td>
<td>The 8-bit data bus</td>
</tr>
<tr>
<td>11</td>
<td>DB4</td>
<td>I/O</td>
<td>The 8-bit data bus</td>
</tr>
<tr>
<td>12</td>
<td>DB5</td>
<td>I/O</td>
<td>The 8-bit data bus</td>
</tr>
<tr>
<td>13</td>
<td>DB6</td>
<td>I/O</td>
<td>The 8-bit data bus</td>
</tr>
<tr>
<td>14</td>
<td>DB7</td>
<td>I/O</td>
<td>The 8-bit data bus</td>
</tr>
</tbody>
</table>
• **Connection to 8051**
  - In our lab the connection is slightly different
operations
- We can either read/write command or data to LCD
  - Command: e.g. clear screen, return home, decrement cursor… (P. 359, Table 12-4)
  - Data: the ASCII code to be displayed
example: write command to LCD
- Use command to clear LCD display
  rs bit p3.2
  rw bit p3.3
  en bit p3.4
mov a, #01h ; 01h: clear screen, command to be written to LCD
clr rw ; rw = 0: write to LCD
clr rs ; rs = 0: write command
mov p1, a
setb en ; a high pulse with width at least 450 ns
acall delay
clr en
**LCD**

- **Example: write data to LCD**
  - Write ‘A’ to the current cursor location of LCD display
    
    RS BIT P3.2  
    RW BIT P3.3  
    EN BIT P3.4  

    MOV A, #'A' ;  
    CLR RW ; RW = 0: write to LCD  
    SETB RS ; RS = 1: write data  
    MOV P1, A  
    SETB EN ; a high pulse with width at least 450 ns  
    ACALL DELAY  
    CLR EN  

- **Complete code can be found in Prog. 12-1, Prog. 12-2.**