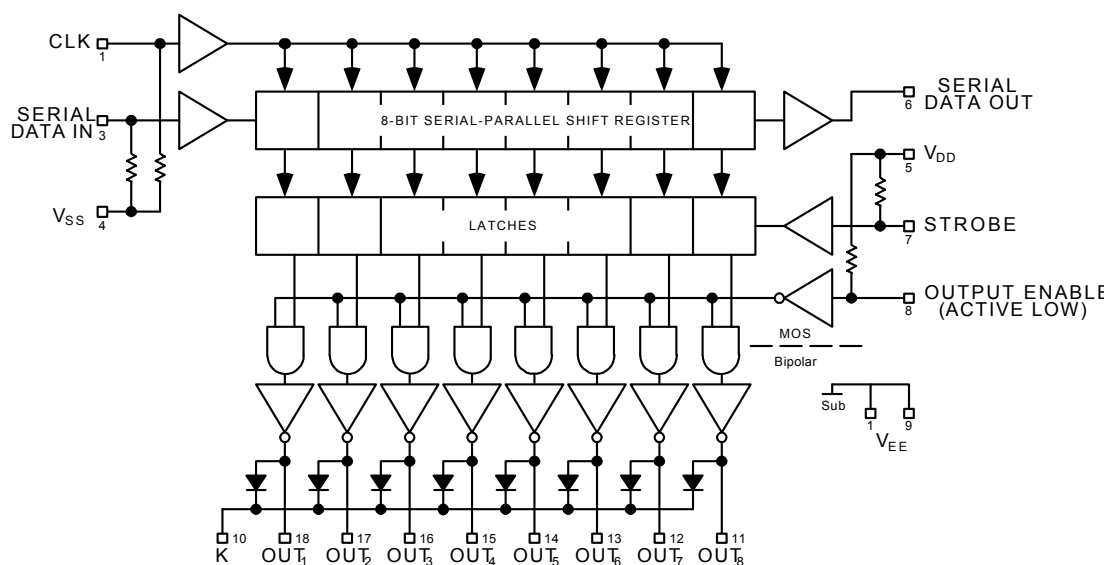
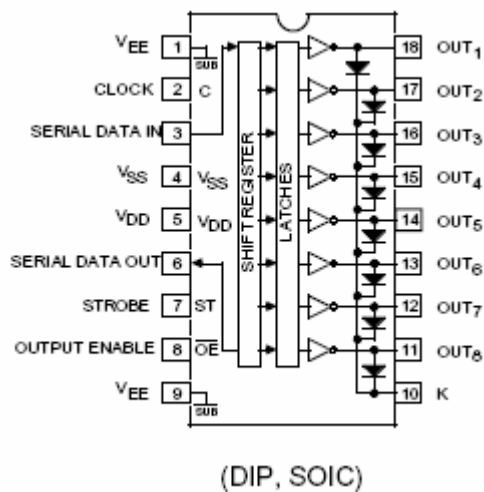
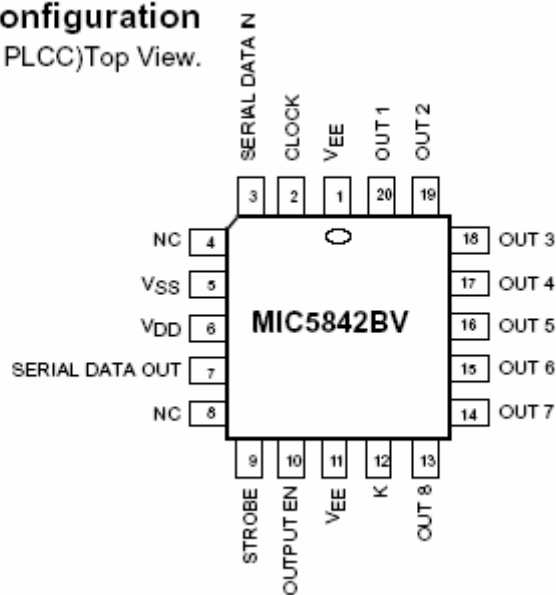


## Functional Diagram



## Pin Configuration

(20-Pin PLCC) Top View.



|                                                        |     |
|--------------------------------------------------------|-----|
| At 25°C Free-Air Temperature and $V_{SS}$              | 0V  |
| Output Voltage, $V_{CE}$ (MIC5841)                     | 50V |
| (MIC5842)                                              | 80V |
| Output Voltage, $V_{CE(SUS)}$ (MIC5841) <sup>(1)</sup> | 35V |
| (MIC5842)                                              | 50V |
| Logic Supply Voltage, $V_{DD}$                         | 15V |
| $V_{DD}$ with Reference to $V_{FF}$                    | 25V |

|                                              |                          |
|----------------------------------------------|--------------------------|
| Emitter Supply Voltage, $V_{EE}$ .....       | –20V                     |
| Input Voltage Range, $V_{IN}$ .....          | –0.3V to $V_{DD} + 0.3V$ |
| Continuous Output Current, $I_{OUT}$ .....   | 500mA                    |
| Package Power Dissipation, $P_D^{(2)}$ ..... | 1.82W                    |
| Operating Temperature Range, $T_A$ .....     | –55°C to +85°C           |
| Storage Temperature Range, $T_S$ .....       | –65°C to +150°C          |

At  $T_A = 25^\circ\text{C}$   $V_{DD} = 5\text{V}$ ,  $V_{SS} = V_{FF} = 0\text{V}$  (unless otherwise noted)

| Characteristic                       | Symbol                              | Applicable Devices        | Test Conditions                                  | Limits                |      |      |
|--------------------------------------|-------------------------------------|---------------------------|--------------------------------------------------|-----------------------|------|------|
|                                      |                                     |                           |                                                  | Min                   | Max  | Unit |
| Output Leakage Current               | I <sub>CEX</sub>                    | MIC5841                   | V <sub>OUT</sub> = 50V                           |                       | 50   | μA   |
|                                      |                                     |                           | V <sub>OUT</sub> = 50V, T <sub>A</sub> = +70°C   |                       | 100  |      |
|                                      |                                     | MIC5842                   | V <sub>OUT</sub> = 80V                           |                       | 50   |      |
|                                      |                                     |                           | V <sub>OUT</sub> = 80V, T <sub>A</sub> = +70°C   |                       | 100  |      |
| Collector-Emitter Saturation Voltage | V <sub>CE(SAT)</sub>                | Both                      | I <sub>OUT</sub> = 100mA                         |                       | 1.1  | V    |
|                                      |                                     |                           | I <sub>OUT</sub> = 200mA                         |                       | 1.3  |      |
|                                      |                                     |                           | I <sub>OUT</sub> = 350mA, V <sub>DD</sub> = 7.0V |                       | 1.6  |      |
| Collector-Emitter Saturation Voltage | V <sub>CE(SUS)</sub> <sup>(5)</sup> | MIC5841                   | I <sub>OUT</sub> = 350mA, L = 2mH                | 35                    |      | V    |
|                                      |                                     | MIC5842                   | I <sub>OUT</sub> = 350mA, L = 2mH                | 50                    |      |      |
| Input Voltage                        | V <sub>IN(0)</sub>                  | Both                      |                                                  |                       | 0.8  | V    |
|                                      | V <sub>IN(1)</sub>                  |                           | Both                                             | V <sub>DD</sub> = 12V | 10.5 |      |
|                                      |                                     | V <sub>DD</sub> = 10V     |                                                  | 8.5                   |      |      |
|                                      |                                     | V <sub>DD</sub> = 5.0V(4) |                                                  | 3.5                   |      |      |
| Input Resistance                     | R <sub>IN</sub>                     | Both                      | V <sub>DD</sub> = 12V                            | 50                    |      | kΩ   |
|                                      |                                     |                           | V <sub>DD</sub> = 10V                            | 50                    |      |      |
|                                      |                                     |                           | V <sub>DD</sub> = 5.0V                           | 50                    |      |      |
| Supply Current                       | I <sub>DD(ON)</sub>                 | Both                      | All Drivers ON, V <sub>DD</sub> = 12V            |                       | 16   | 1.6  |
|                                      |                                     |                           | All Drivers ON, V <sub>DD</sub> = 10V            |                       | 14   |      |
|                                      |                                     |                           | All Drivers ON, V <sub>DD</sub> = 5.0V           |                       | 8.0  |      |
|                                      | I <sub>DD(OFF)</sub>                | Both                      | All Drivers OFF, V <sub>DD</sub> = 12V           |                       | 2.9  |      |
|                                      |                                     |                           | All Drivers OFF, V <sub>DD</sub> = 10V           |                       | 2.5  |      |
|                                      |                                     |                           | All Drivers OFF, V <sub>DD</sub> = 5.0V          |                       | 1.6  |      |
| Clamp Diode Leakage Current          | I <sub>R</sub>                      | MIC5841                   | V <sub>R</sub> = 50V                             |                       | 50   | μA   |
|                                      |                                     | MIC5842                   | V <sub>R</sub> = 80V                             |                       | 50   |      |
| Clamp Diode Forward Voltage          | V <sub>F</sub>                      | Both                      | I <sub>F</sub> = 350mA                           |                       | 2.0  | V    |

## Electrical Characteristics

At  $T_A = -55^\circ\text{C}$   $V_{DD} = 5\text{V}$ ,  $V_{SS} = V_{EE} = 0\text{V}$  (unless otherwise noted)

| Characteristic                       | Symbol        | Test Conditions                                   | Limits |     |                  |
|--------------------------------------|---------------|---------------------------------------------------|--------|-----|------------------|
|                                      |               |                                                   | Min    | Max | Unit             |
| Output Leakage Current               | $I_{CEX}$     | $V_{OUT} = 80\text{V}$                            |        | 50  | $\mu\text{A}$    |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_{OUT} = 100\text{mA}$                          |        | 1.3 | V                |
|                                      |               | $I_{OUT} = 200\text{mA}$                          |        | 1.5 |                  |
|                                      |               | $I_{OUT} = 350\text{mA}$ , $V_{DD} = 7.0\text{V}$ |        | 1.8 |                  |
| Input Voltage                        | $V_{IN(0)}$   |                                                   |        | 0.8 | V                |
|                                      | $V_{IN(1)}$   | $V_{DD} = 12\text{V}$                             | 10.5   |     |                  |
|                                      |               | $V_{DD} = 5.0\text{V}$                            | 3.5    |     |                  |
| Input Resistance                     | $R_{IN}$      | $V_{DD} = 12\text{V}$                             | 35     |     | $\text{k}\Omega$ |
|                                      |               | $V_{DD} = 10\text{V}$                             | 35     |     |                  |
|                                      |               | $V_{DD} = 5.0\text{V}$                            | 35     |     |                  |
| Supply Current                       | $I_{DD(ON)}$  | All Drivers ON, $V_{DD} = 12\text{V}$             |        | 16  | mA               |
|                                      |               | All Drivers ON, $V_{DD} = 10\text{V}$             |        | 14  |                  |
|                                      |               | All Drivers ON, $V_{DD} = 5.0\text{V}$            |        | 10  |                  |
|                                      | $I_{DD(OFF)}$ | All Drivers OFF, $V_{DD} = 12\text{V}$            |        | 3.5 |                  |
|                                      |               | All Drivers OFF, $V_{DD} = 5.0\text{V}$           |        | 2.0 |                  |

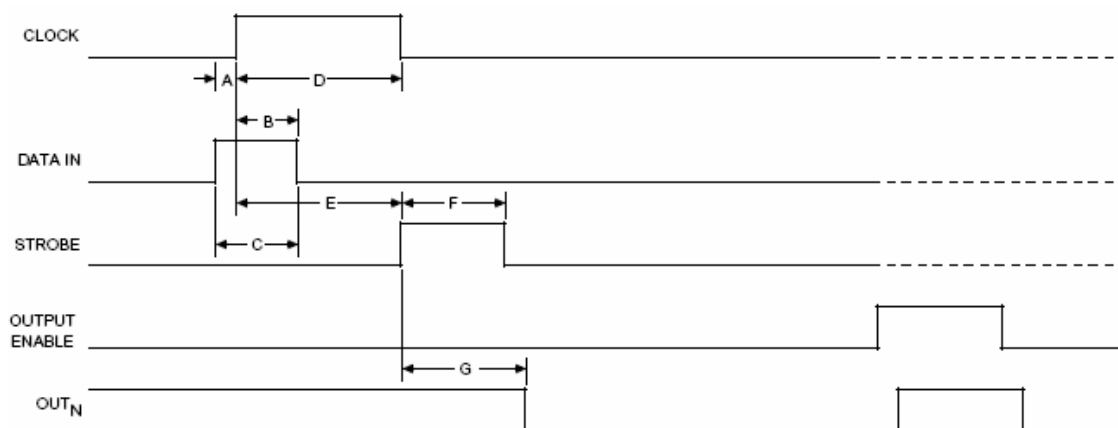
## Electrical Characteristics

At  $T_A = +125^\circ\text{C}$   $V_{DD} = 5\text{V}$ ,  $V_{SS} = V_{EE} = 0\text{V}$  (unless otherwise noted)

| Characteristic                       | Symbol        | Test Conditions                                   | Limits |       |                  |
|--------------------------------------|---------------|---------------------------------------------------|--------|-------|------------------|
|                                      |               |                                                   | Min    | Max   | Unit             |
| Output Leakage Current               | $I_{CEX}$     | $V_{OUT} = 80\text{V}$                            |        | 500   | $\mu\text{A}$    |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_{OUT} = 100\text{mA}$                          |        | 1.3   | V                |
|                                      |               | $I_{OUT} = 200\text{mA}$                          |        | 1.5   |                  |
|                                      |               | $I_{OUT} = 350\text{mA}$ , $V_{DD} = 7.0\text{V}$ |        | 1.8   |                  |
| Input Voltage                        | $V_{IN(0)}$   |                                                   |        | 0.8   | V                |
|                                      | $V_{IN(1)}$   | $V_{DD} = 12\text{V}$                             | 10.5   |       |                  |
|                                      |               | $V_{DD} = 5.0\text{V}$                            | 3.5    |       |                  |
| Input Resistance                     | $R_{IN}$      | $V_{DD} = 12\text{V}$                             | 50     |       | $\text{k}\Omega$ |
|                                      |               | $V_{DD} = 10\text{V}$                             | 50     |       |                  |
|                                      |               | $V_{DD} = 5.0\text{V}$                            | 50     |       |                  |
| Supply Current                       | $I_{DD(ON)}$  | All Drivers ON, $V_{DD} = 12\text{V}$             |        | 16    | mA               |
|                                      |               | All Drivers ON, $V_{DD} = 10\text{V}$             |        | 14    |                  |
|                                      |               | All Drivers ON, $V_{DD} = 5.0\text{V}$            |        | 8     |                  |
|                                      | $I_{DD(OFF)}$ | All Drivers OFF, $V_{DD} = 12\text{V}$            |        | 2.9   |                  |
|                                      |               | All Drivers OFF, $V_{DD} = 5.0\text{V}$           |        | 2.1.6 |                  |
| Clamp Diode Leakage Current          | $I_R$         | MIC5841A $V_R = 50\text{V}$                       |        | 1.6   | $\mu\text{A}$    |
|                                      |               | MIC5842A $V_R = 80\text{V}$                       |        | 100   |                  |

### Notes:

1. For Inductive load applications.
2. Derate at the rate of  $18.2\text{mW}/^\circ\text{C}$  above  $T_A = 25^\circ\text{C}$  (Plastic DIP)
3. CMOS devices have input-static protection but are susceptible to damage when exposed to extremely high static electrical charges.
4. Operation of these devices with standard TTL may require the use of appropriate pull-up resistors to insure an input logic HIGH.
5. Not 100% tested. Guaranteed by design.



## Timing Conditions

(TA = 25°C Logic Levels are V<sub>DD</sub> and V<sub>SS</sub>)

V<sub>DD</sub> = 5V

|                                                                        |        |
|------------------------------------------------------------------------|--------|
| A. Minimum Data Active Time Before Clock Pulse (Data Set-Up Time)..... | 75 ns  |
| B. Minimum Data Active Time After Clock Pulse (Data Hold Time) .....   | 75 ns  |
| C. Minimum Data Pulse Width .....                                      | 150 ns |
| D. Minimum Clock Pulse Width.....                                      | 150 ns |
| E. Minimum Time Between Clock Activation and Strobe .....              | 300 ns |
| F. Minimum Strobe Pulse Width.....                                     | 100 ns |
| G. Typical Time Between Strobe Activation and Output Transition.....   | 500 ns |

SERIAL DATA present at the input is transferred to the shift register on the logic “0” to logic “1” transition of the CLOCK input pulse. On succeeding CLOCK pulses, the registers shift data information towards the SERIAL DATA OUTPUT. The SERIAL DATA must appear at the input prior to the rising edge of the CLOCK input waveform.

Information present at any register is transferred to its respective latch when the STROBE is high (serial-to-parallel conversion). The latches will continue to accept new data as long as the STROBE is held high. Applications where the latches are bypassed (STROBE tied high) will require that the ENABLE input be high during serial data entry.

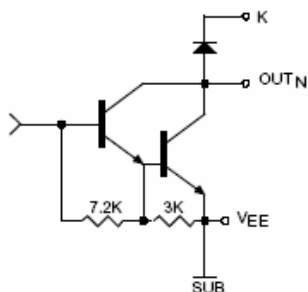
When the ENABLE input is high, all of the output buffers are disabled (OFF) without affecting information stored in the latches or shift register. With the ENABLE input low, the outputs are controlled by the state of the latches.

## MIC5840 Family Truth Table

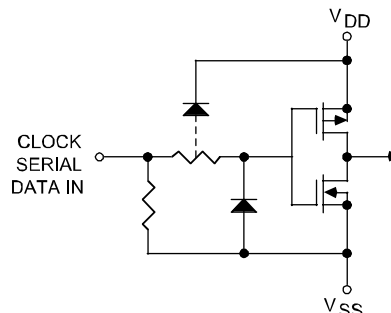
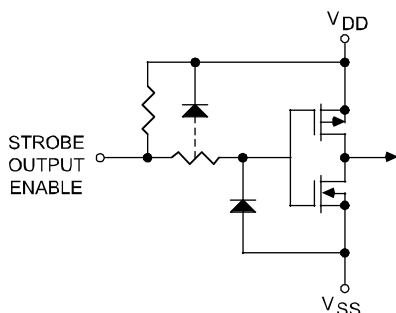
| Serial Data Input | Clock Input | Shift Register Contents |                |                |     |                | Serial Data Output | Strobe Input | Latch Contents |                |                |     |                | Output Enable | Output Contents |                |                |     |                |
|-------------------|-------------|-------------------------|----------------|----------------|-----|----------------|--------------------|--------------|----------------|----------------|----------------|-----|----------------|---------------|-----------------|----------------|----------------|-----|----------------|
|                   |             | I <sub>1</sub>          | I <sub>2</sub> | I <sub>3</sub> | ... | I <sub>8</sub> |                    |              | I <sub>1</sub> | I <sub>2</sub> | I <sub>3</sub> | ... | I <sub>8</sub> |               | O <sub>1</sub>  | O <sub>2</sub> | O <sub>3</sub> | ... | O <sub>8</sub> |
| H                 |             | H                       | R1             | R2             | ... | R7             | R7                 |              |                |                |                |     |                |               |                 |                |                |     |                |
| L                 |             | L                       | R1             | R2             | ... | R7             | R7                 |              |                |                |                |     |                |               |                 |                |                |     |                |
| X                 |             | R1                      | R2             | R3             | ... | R8             | R8                 |              |                |                |                |     |                |               |                 |                |                |     |                |
|                   |             | X                       | X              | X              | ... | X              | X                  | L            | R1             | R2             | R3             | ... | R8             | L             | P1              | P2             | P3             | ... | P8             |
|                   |             | P1                      | P2             | P3             | ... | P8             | P8                 | H            | P1             | P2             | P3             | ... | P8             |               | P1              | P2             | P3             | ... | P8             |
|                   |             |                         |                |                |     |                |                    |              | X              | X              | X              | ... | X              |               | H               | H              | H              | ... | H              |

L = Low Logic Level  
H = High Logic Level  
X = Irrelevant  
P = Present State  
R = Previous State

## Typical Output Driver



## Typical Input Circuits



## Maximum Allowable Duty Cycle (Plastic DIP)

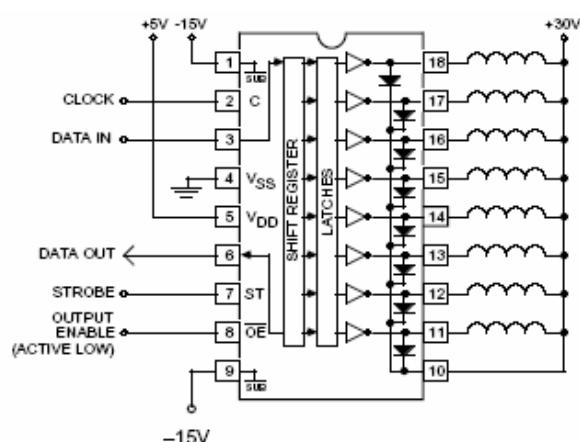
$V_{DD} = 5.0V$

| Number of Outputs ON<br>( $I_{OUT} = 200mA$<br>$V_{DD} = 5.0V$ ) | Max. Allowable Duty Cycle at Ambient Temperature of |      |      |      |      |
|------------------------------------------------------------------|-----------------------------------------------------|------|------|------|------|
|                                                                  | 25°C                                                | 40°C | 50°C | 60°C | 70°C |
| 8                                                                | 85%                                                 | 72%  | 64%  | 55%  | 46%  |
| 7                                                                | 97%                                                 | 82%  | 73%  | 63%  | 53%  |
| 6                                                                | 100%                                                | 96%  | 85%  | 73%  | 62%  |
| 5                                                                | 100%                                                | 100% | 100% | 88%  | 75%  |
| 4                                                                | 100%                                                | 100% | 100% | 100% | 93%  |
| 3                                                                | 100%                                                | 100% | 100% | 100% | 100% |
| 2                                                                | 100%                                                | 100% | 100% | 100% | 100% |
| 1                                                                | 100%                                                | 100% | 100% | 100% | 100% |

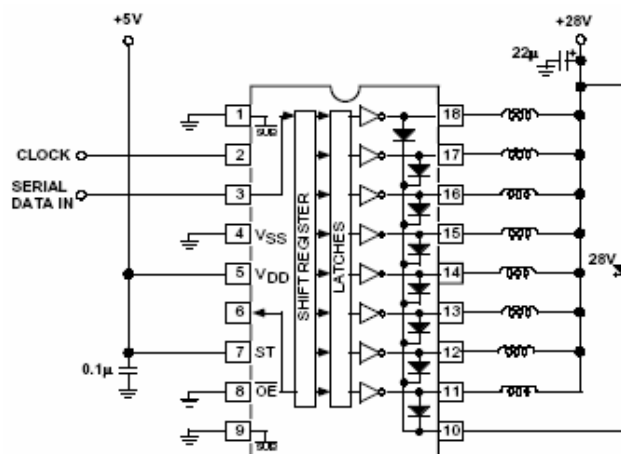
$V_{DD} = 12V$

| Number of Outputs ON<br>( $I_{OUT} = 200mA$<br>$V_{DD} = 12V$ ) | Max. Allowable Duty Cycle at Ambient Temperature of |      |      |      |      |
|-----------------------------------------------------------------|-----------------------------------------------------|------|------|------|------|
|                                                                 | 25°C                                                | 40°C | 50°C | 60°C | 70°C |
| 8                                                               | 80%                                                 | 68%  | 60%  | 52%  | 44%  |
| 7                                                               | 91%                                                 | 77%  | 68%  | 59%  | 50%  |
| 6                                                               | 100%                                                | 90%  | 79%  | 69%  | 58%  |
| 5                                                               | 100%                                                | 100% | 95%  | 82%  | 69%  |
| 4                                                               | 100%                                                | 100% | 100% | 100% | 86%  |
| 3                                                               | 100%                                                | 100% | 100% | 100% | 100% |
| 2                                                               | 100%                                                | 100% | 100% | 100% | 100% |
| 1                                                               | 100%                                                | 100% | 100% | 100% | 100% |

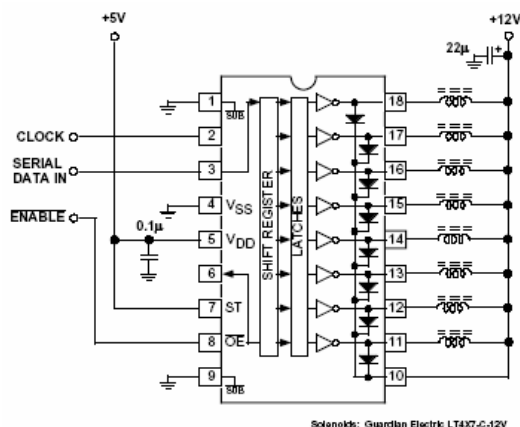
## Typical Applications



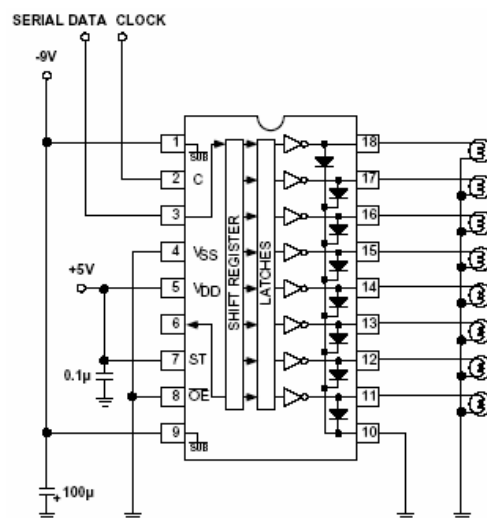
Relay/Solenoid Driver MIC5842



MIC5841 Hammer Driver



MIC5841 Solenoid Driver with Output Enable



MIC5841 Level Shifting Lamp Driver with Darlington Emitters Tied to a Negative Supply

The circuit diagram shows a 3-bit shift register with three latches (D1, D2, D3) and a truth table. The shift register has 9 pins: 1 (SUB), 2 (C), 3 (SUB), 4 (VSS), 5 (VDD), 6 (SUB), 7 (ST), 8 (OE), and 9 (SUB). The latches are connected to pins 18, 17, 16, 15, 14, 13, 12, 11, and 10. The truth table is as follows:

|          | D1<br>(Latch 1) | D2<br>(Latch 5) | D3<br>(Latch 8) |
|----------|-----------------|-----------------|-----------------|
| Receive  | OFF             | ACTIVE          | OFF             |
| Transmit | ACTIVE          | OFF             | ACTIVE          |

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