



MIC5841/5842

8-Bit Serial-Input Latched Drivers

General Description

Using BiCMOS technology, the MIC5841/5842 integrated circuits were fabricated to be used in a wide variety of peripheral power driver applications. The devices each have an eight-bit CMOS shift register, CMOS control circuitry, eight CMOS data latches, and eight bipolar current-sink Darlington output drivers.

These two devices differ only in maximum voltage ratings. The MIC5842 offers premium performance with a minimum output breakdown voltage rating of 80V (50V sustaining). The drivers can be operated with a split supply where the negative supply is down to -20V.

The 500mA outputs, with integral transient-suppression diodes, are suitable for use with lamps, relays, solenoids and other inductive loads.

These devices have improved speed characteristics. With a 5V logic supply, they will typically operate faster than 5 MHz. With a 12V supply, significantly higher speeds are obtained. The CMOS inputs are compatible with standard CMOS, PMOS, and NMOS logic levels. TTL or DTL circuits may require the use of appropriate pull-up resistors. By using the serial data output, the drivers can be cascaded for interface applications requiring additional drive lines.

The MIC5840 family is available in DIP, PLCC, and SOIC packages. Because of limitations on package power dissipation, the simultaneous operation of all drivers at maximum rated current might require a reduction in duty cycle. A copper-alloy lead frame provides for maximum package power dissipation.

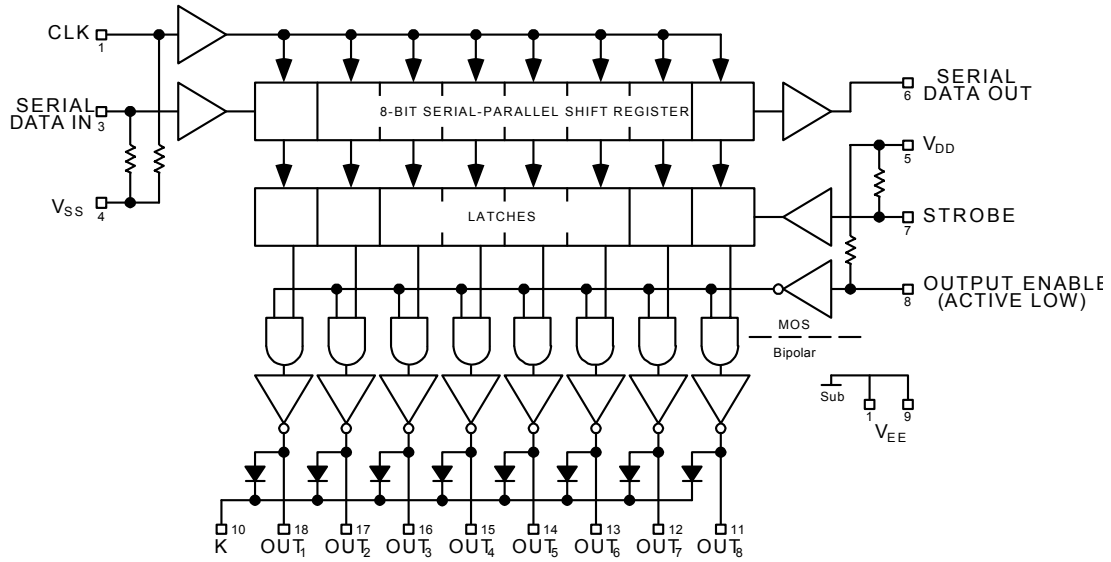
Features

- 3.3 MHz Minimum Data-Input Rate
- CMOS, PMOS, NMOS, TTL Compatible
- Internal Pull-Up/Pull-Down Resistors
- Low-Power CMOS Logic and Latches
- High-Voltage Current-Sink Outputs
- Output Transient-Protection Diodes
- Single or Split Supply Operation

Ordering Information

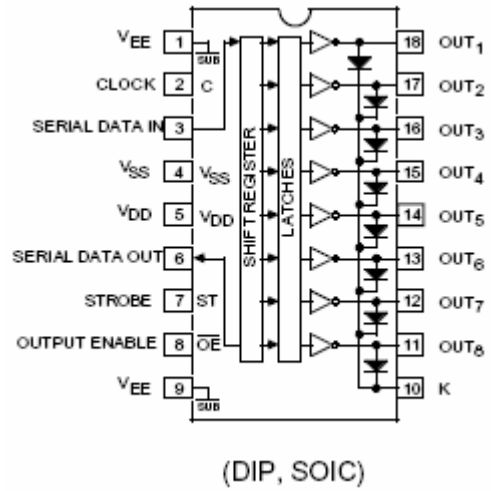
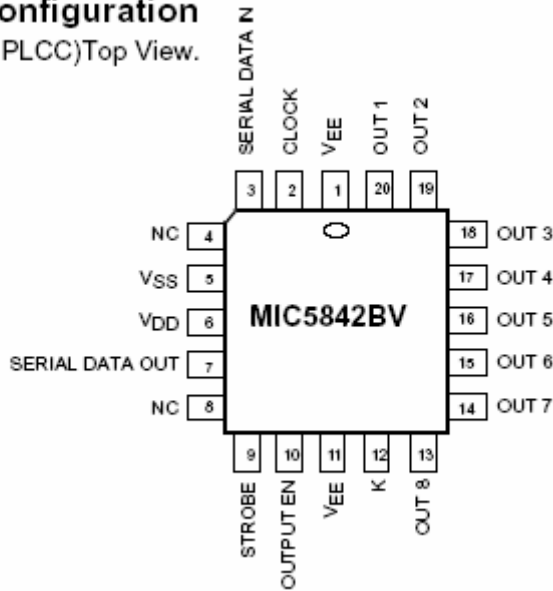
| Part Number | | Temperature Range | Package |
|-------------|------------|-------------------|--------------------|
| Standard | Pb-Free | | |
| MIC5841BN | MIC5841YN | -40°C to +85°C | 18-Pin Plastic DIP |
| MIC5841BV | MIC5841YV | -40°C to +85°C | 20-Pin PLCC |
| MIC5841BWM | MIC5841YWM | -40°C to +85°C | 18-Pin Wide SOIC |
| MIC5842BN | MIC5842YN | -40°C to +85°C | 18-Pin Plastic DIP |
| MIC5842BV | MIC5842YV | -40°C to +85°C | 20-Pin PLCC |
| MIC5842BWM | MIC5842YWM | -40°C to +85°C | 18-Pin Wide SOIC |

Functional Diagram



Pin Configuration

(20-Pin PLCC) Top View.



Absolute Maximum Ratings^(1,2,3)

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

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

| Characteristic | Symbol | Applicable Devices | Test Conditions | Limits | | |
|--------------------------------------|---------------------|--------------------|--|--------|-----|---------------|
| | | | | Min | Max | Unit |
| Output Leakage Current | I_{CEX} | MIC5841 | $V_{OUT} = 50V$ | | 50 | μA |
| | | | $V_{OUT} = 50V, T_A = +70^\circ\text{C}$ | | 100 | |
| | | MIC5842 | $V_{OUT} = 80V$ | | 50 | |
| | | | $V_{OUT} = 80V, T_A = +70^\circ\text{C}$ | | 100 | |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | Both | $I_{OUT} = 100\text{mA}$ | | 1.1 | V |
| | | | $I_{OUT} = 200\text{mA}$ | | 1.3 | |
| | | | $I_{OUT} = 350\text{mA}, V_{DD} = 7.0V$ | | 1.6 | |
| Collector-Emitter Saturation Voltage | $V_{CE(SUS)}^{(5)}$ | MIC5841 | $I_{OUT} = 350\text{mA}, L = 2\text{mH}$ | 35 | | V |
| | | MIC5842 | $I_{OUT} = 350\text{mA}, L = 2\text{mH}$ | 50 | | |
| Input Voltage | $V_{IN(0)}$ | Both | | | 0.8 | V |
| | $V_{IN(1)}$ | Both | $V_{DD} = 12V$ | 10.5 | | |
| | | | $V_{DD} = 10V$ | 8.5 | | |
| | | | $V_{DD} = 5.0V(4)$ | 3.5 | | |
| Input Resistance | R_{IN} | Both | $V_{DD} = 12V$ | 50 | | $k\Omega$ |
| | | | $V_{DD} = 10V$ | 50 | | |
| | | | $V_{DD} = 5.0V$ | 50 | | |
| Supply Current | $I_{DD(ON)}$ | Both | All Drivers ON, $V_{DD} = 12V$ | | 16 | 1.6 |
| | | | All Drivers ON, $V_{DD} = 10V$ | | 14 | |
| | | | All Drivers ON, $V_{DD} = 5.0V$ | | 8.0 | |
| | $I_{DD(OFF)}$ | Both | All Drivers OFF, $V_{DD} = 12V$ | | 2.9 | |
| | | | All Drivers OFF, $V_{DD} = 10V$ | | 2.5 | |
| | | | All Drivers OFF, $V_{DD} = 5.0V$ | | 1.6 | |
| Clamp Diode Leakage Current | I_R | MIC5841 | $V_R = 50V$ | | 50 | μA |
| | | MIC5842 | $V_R = 80V$ | | 50 | |
| Clamp Diode Forward Voltage | V_F | Both | $I_F = 350\text{mA}$ | | 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 | μA |
| 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

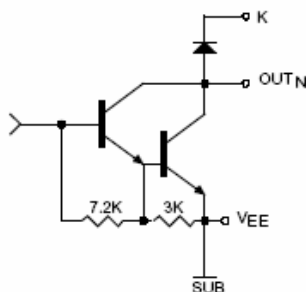
At $T_A = +125^\circ\text{C}$ $V_{DD} = 5\text{V}$, $V_{SS} = V_{EE} = 0\text{V}$ (unless otherwise noted)

| Characteristic | Symbol | Test Conditions | Limits | | |
|--------------------------------------|---------------|---|--------|-------|------------------|
| | | | Min | Max | Unit |
| Output Leakage Current | I_{CEX} | $V_{OUT} = 80\text{V}$ | | 500 | μA |
| 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 | μA |
| | | 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.

Typical Output Driver



Typical Input Circuits



Maximum Allowable Duty Cycle (Plastic DIP)

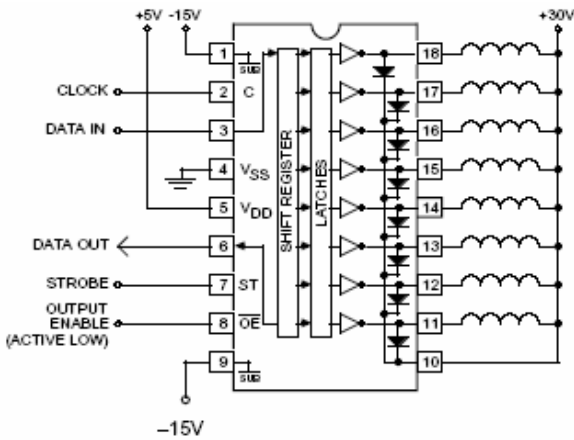
$V_{DD} = 5.0V$

| Number of Outputs ON ($I_{OUT} = 200mA$ $V_{DD} = 5.0V$) | 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% |

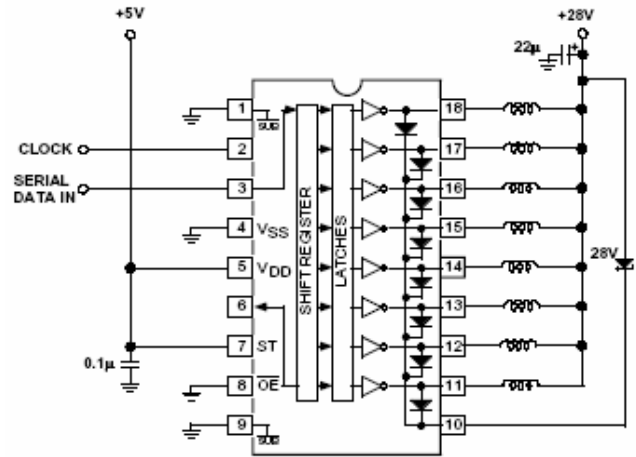
$V_{DD} = 12V$

| Number of Outputs ON ($I_{OUT} = 200mA$ $V_{DD} = 12V$) | 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



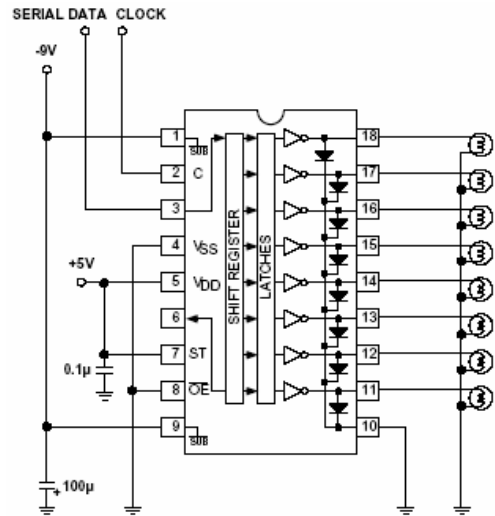
Relay/Solenoid Driver MIC5842



MIC5841 Hammer Driver



MIC5841 Solenoid Driver with Output Enable



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

Typical Applications, Continued



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