

### General Description

BiCMOS technology gives the MIC5821/5822 family flexibility beyond the reach of standard logic buffers and power driver arrays. These devices each have an eight-bit CMOS shift register, CMOS control circuitry, eight CMOS data latches, and eight bipolar current-sink Darlington output drivers. The 500mA outputs are suitable for use with incandescent bulbs and other moderate to high current loads. The drivers can be operated with a split supply where the negative supply is down to  $-20V$ . Except for maximum driver output voltage ratings, the MIC5821 and MIC5822 are identical.

These devices have greatly improved data-input rates. 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 and 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.

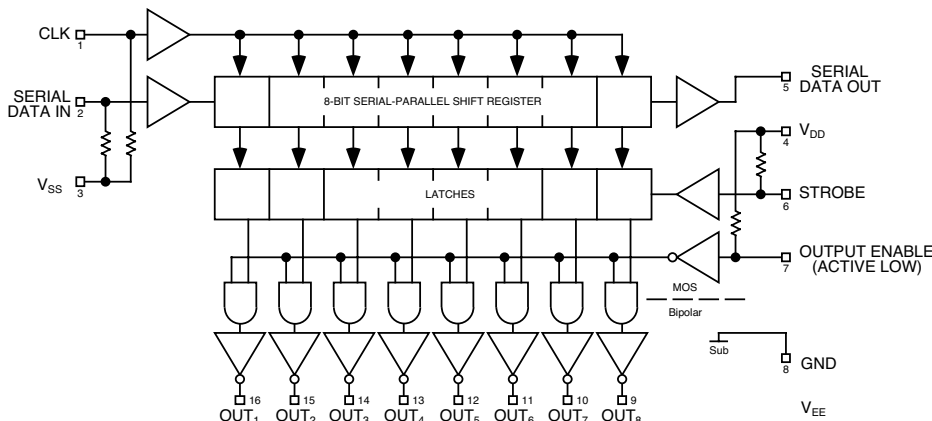
### Features

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

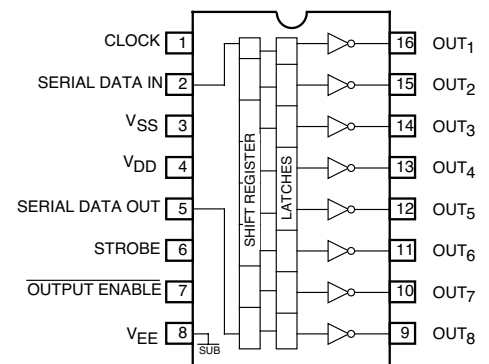
### Ordering Information

Part Number		Temp Range	Package
Standard	Pb-Free		
MIC5821BN	MIC5821YN	$-40^{\circ}C$ to $+85^{\circ}C$	16-Pin Plastic DIP
MIC5822BN	MIC5822YN	$-40^{\circ}C$ to $+85^{\circ}C$	16-Pin Plastic DIP

### Functional Diagram

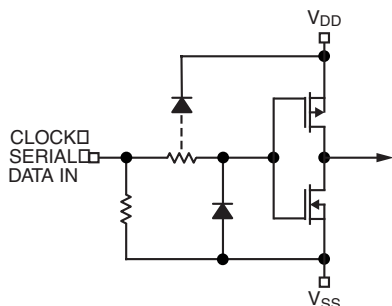
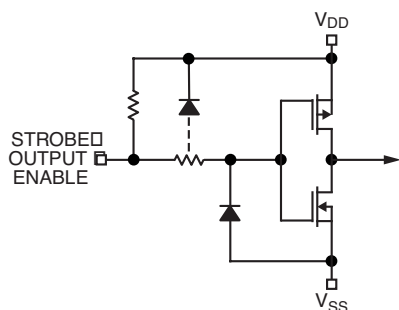


### Pin Configuration



(Plastic DIP)

## Typical Input Circuits



## Absolute Maximum Ratings (Note 1)

at 25°C Free-Air Temperature and  $V_{SS} = 0V$

Output Voltage, $V_{CE}$	(MIC5821)	50V
	(MIC5822)	80V
Output Voltage, $V_{CE\ SUS}$	(MIC5821)(Note 3)	35V
	(MIC5822)(Note 3)	50V
Logic Supply Voltage, $V_{DD}$		15V
Input Voltage Range, $V_{IN}$		-0.3V to $V_{DD} + 0.3V$
$V_{DD} - V_{EE}$		25V
Emitter Supply Voltage, $V_{EE}$		-20V
Continuous Output Current, $I_{OUT}$		500mA
Package Power Dissipation, $P_D$ (Note 1)		1.67W
Operating Temperature Range, $T_A$		-55°C to +85°C
Storage Temperature Range, $T_S$		-65°C to +150°C

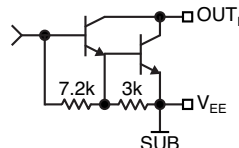
Note 1: Derate at the rate of 16.7mW/°C above  $T_A = 25°C$ .

Note 2: CMOS devices have input static protection but are susceptible to damage when exposed to extremely high static electrical charges.

Note 3: For inductive load applications.

Note 4: Specification for packaged product only.

## Typical Output Driver



## Maximum Allowable Duty Cycle (Plastic DIP)

Number of Outputs ON ( $I_{OUT} = 200mA$ $V_{DD} = 12V$ )	Maximum Allowable Duty Cycle at Ambient Temperature of				
	25°C	40°C	50°C	60°C	70°C
8	73%	62%	55%	47%	40%
7	83%	71%	62%	54%	46%
6	97%	82%	72%	63%	53%
5	100%	98%	87%	75%	63%
4	100%	100%	100%	93%	79%
3	100%	100%	100%	100%	100%
2	100%	100%	100%	100%	100%
1	100%	100%	100%	100%	100%

**Electrical Characteristics (Note 4)** at  $T_A = 25^\circ\text{C}$   $V_{DD} = 5\text{V}$ ,  $V_{EE} = V_{SS} = 0\text{V}$  (unless otherwise specified)

Characteristic	Symbol	Applicable Devices	Test Conditions	Limits		
				Min.	Max.	Unit
Output Leakage Current	$I_{CEX}$	MIC5821	$V_{OUT} = 50\text{V}$		50	$\mu\text{A}$
			$V_{OUT} = 50\text{V}$ , $T_A = +70^\circ\text{C}$		100	
		MIC5822	$V_{OUT} = 80\text{V}$		50	
			$V_{OUT} = 80\text{V}$ , $T_A = +70^\circ\text{C}$		100	
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	Both	$I_{OUT} = 100\text{mA}$		1.1	V
			$I_{OUT} = 200\text{mA}$		1.3	
			$I_{OUT} = 350\text{mA}$ , $V_{DD} = 7.0\text{V}$		1.6	
Input Voltage	$V_{IN(0)}$	Both			0.8	V
	$V_{IN(1)}$	Both	$V_{DD} = 12\text{V}$	10.5		
			$V_{DD} = 10\text{V}$	8.5		
			$V_{DD} = 5.0\text{V}$	3.5		
Input Resistance	$R_{IN}$	Both	$V_{DD} = 12\text{V}$	50		$\text{k}\Omega$
			$V_{DD} = 10\text{V}$	50		
			$V_{DD} = 5.0\text{V}$	50		
Supply Current	$I_{DD(ON)}$	Both	One Driver ON, $V_{DD} = 12\text{V}$		4.5	mA
			One Driver ON, $V_{DD} = 10\text{V}$		3.9	
			One Driver ON, $V_{DD} = 5.0\text{V}$		2.4	
			All Drivers ON, $V_{DD} = 12\text{V}$		16	
			All Drivers ON, $V_{DD} = 10\text{V}$		14	
			All Drivers ON, $V_{DD} = 5.0\text{V}$		8	
	$I_{DD(OFF)}$	Both	All Drivers OFF, $V_{DD} = 5.0\text{V}$ , All Inputs = 0V		1.6	
			All Drivers OFF, $V_{DD} = 12\text{V}$ , All Inputs = 0V		2.9	

**Electrical Characteristics (Note 4)**  $T_A = -55^\circ\text{C}$ ,  $V_{DD} = 5\text{V}$ ,  $V_{SS} = V_{EE} = 0\text{V}$  (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	$I_{DD(ON)}$	Both	One Driver ON, $V_{DD} = 12\text{V}$		5.5	mA
			One Driver ON, $V_{DD} = 10\text{V}$		4.5	
			One Driver ON, $V_{DD} = 5.0\text{V}$		3.0	
			All Drivers ON, $V_{DD} = 12\text{V}$		16	
			All Drivers ON, $V_{DD} = 10\text{V}$		14	
			All Drivers ON, $V_{DD} = 5.0\text{V}$		10	
	$I_{DD(OFF)}$	Both	All Drivers OFF, $V_{DD} = 12\text{V}$		3.5	
			All Drivers OFF, $V_{DD} = 5.0\text{V}$		2.0	

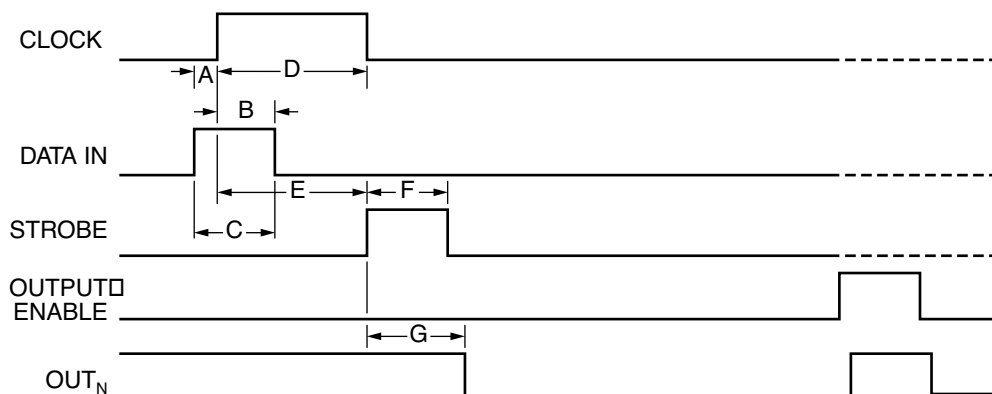
**Electrical Characteristics (Note 4)**  $T_A = +125^{\circ}\text{C}$ ,  $V_{DD} = 5\text{V}$ ,  $V_{SS} = V_{EE} = 0\text{V}$  (unless otherwise noted)

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		
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	$I_{DD(ON)}$	One Driver ON, $V_{DD} = 12\text{V}$		4.5	mA
		One Driver ON, $V_{DD} = 10\text{V}$		3.9	
		One Driver ON, $V_{DD} = 5.0\text{V}$		2.4	
		All Drivers ON, $V_{DD} = 12\text{V}$		16	
		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, $V_{DD} = 5.0\text{V}$		1.6	

**MIC5821/5822 Family Truth Table**

Serial Data Input	Clock Input	Shift Register Contents					Serial Data Output	Strobe Input	Latch Contents					Output Enable	Output Contents								
		$I_1$	$I_2$	$I_3$	.....	$I_8$			$I_1$	$I_2$	$I_3$	.....	$I_8$		$O_1$	$O_2$	$O_3$	.....	$O_8$				
H	⌋	H	R <sub>1</sub>	R <sub>2</sub>	.....	R <sub>7</sub>	R <sub>7</sub>																
L	⌋	L	R <sub>1</sub>	R <sub>2</sub>	.....	R <sub>7</sub>	R <sub>7</sub>																
X	⌋	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	.....	R <sub>8</sub>	R <sub>8</sub>																
		X	X	X	.....	X	X	L	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	.....	R <sub>8</sub>										
		P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	.....	P <sub>8</sub>	P <sub>8</sub>	H	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	.....	P <sub>8</sub>	L									
		X	X	X	.....	X	X		X	X	X	.....	X	H	H	H	H	.....	H				

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

**Timing Diagram**

## Timing Conditions

( $T_A = +25^\circ\text{C}$ , Logic Levels are  $V_{DD}$  and  $V_{SS}$ )

$V_{DD} = 5.0\text{V}$

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

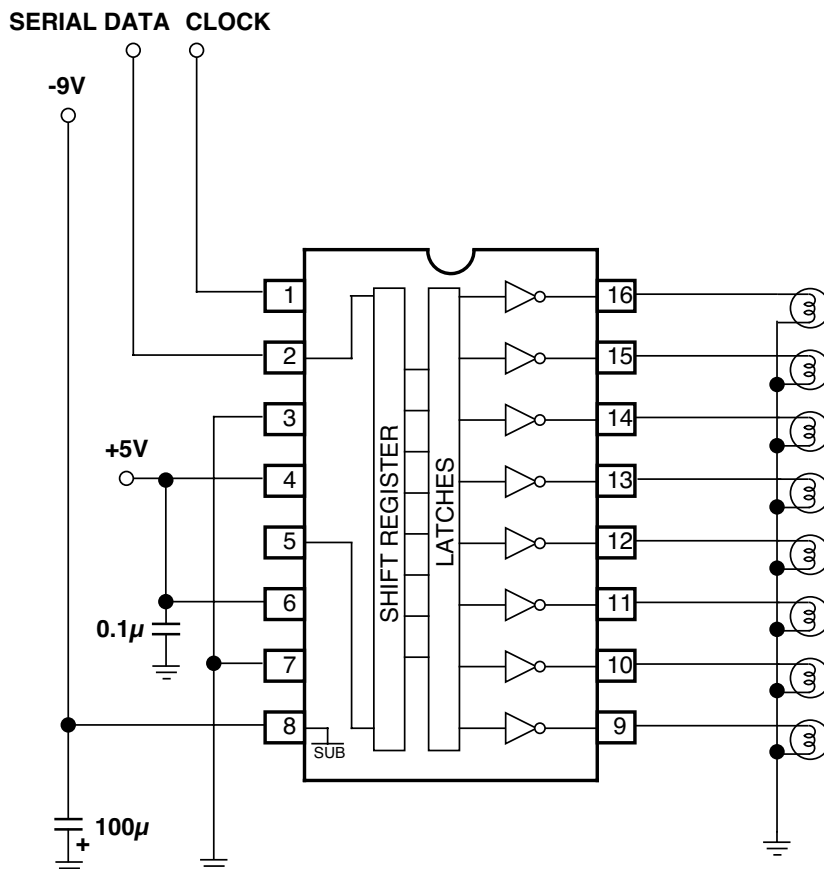
SERIAL DATA present at the input is transferred to the shift register on the logic "0" to logic "1" transition of the CLOCK input pulse. On succeeding CLOCK pulses, the registers shift data information towards the SERIAL DATA OUTPUT. The SERIAL DATA must appear at the input prior to the rising edge of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

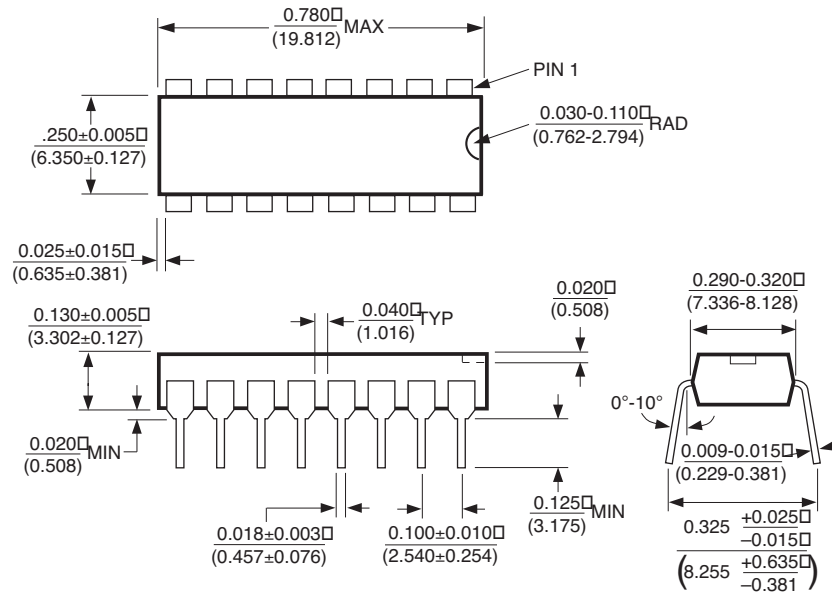
When the ENABLE input is high, all of the output buffers are disabled (OFF) without affecting the information stored in the latches or shift register. With the ENABLE input low, the outputs are controlled by the state of the latches.

## Typical Applications

**MIC5822 Level Shifting Lamp Driver with Darlington Emitters Tied to a Negative Supply**



## Package Information



**16-Pin Plastic DIP (N)**



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