



MC14067B MC14097B

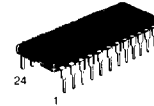
ANALOG MULTIPLEXERS/DEMULTIPLEXERS

The MC14067 and MC14097 multiplexers/demultiplexers are digitally controlled analog switches featuring low ON resistance and very low leakage current. These devices can be used in either digital or analog applications.

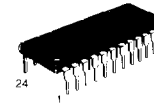
The MC14067 is a 16-channel multiplexer/demultiplexer with an inhibit and four binary control inputs A, B, C, and D. These control inputs select 1-of-16 channels by turning ON the appropriate analog switch (see MC14067 truth table.)

The MC14097 is a differential 8-channel multiplexer/demultiplexer with an inhibit and three binary control inputs A, B, and C. These control inputs select 1 of 8 pairs of channels by turning ON the appropriate analog switches (see MC14097 truth table).

- Low OFF Leakage Current
- Matched Channel Resistance
- Low Quiescent Power Consumption
- Low Crosstalk Between Channels
- Wide Operating Voltage Range: 3 to 18 V
- Low Noise
- Pin for Pin Replacement for CD4067B and CD4097B



L SUFFIX
CERAMIC
CASE 623



P SUFFIX
PLASTIC
CASE 709



DW SUFFIX
SOIC
CASE 751E

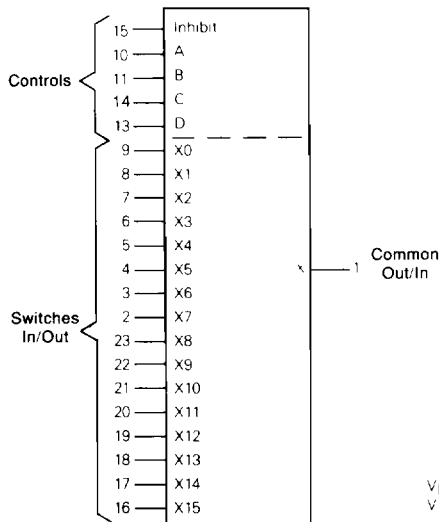
ORDERING INFORMATION

MC14XXXBCP Plastic
MC14XXXBCL Ceramic
MC14XXXBDW SOIC

T_A = -55 to 125°C for all packages.

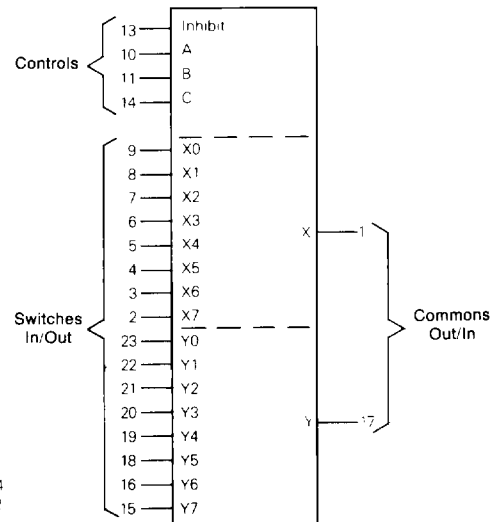
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MC14067B
16-Channel Analog
Multiplexer/Demultiplexer



V_{DD} = Pin 24
V_{SS} = Pin 12

MC14097B
Dual 8-Channel Analog
Multiplexer/Demultiplexer



MC14067B•MC14097B

MAXIMUM RATINGS* (Voltages Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V _{DD}	DC Supply Voltage	-0.5 to +18.0	V
V _{in} , V _{out}	Input or Output Voltage (DC or Transient)	-0.5 to V _{DD} +0.5	V
I _{in}	Input Current (DC or Transient), per Control Pin	± 10	mA
I _{sw}	Switch Through Current	± 25	mA
P _D	Power Dissipation, per Package†	500	mW
T _{stg}	Storage Temperature	-65 to +150	°C
T _L	Lead Temperature (8-Second Soldering)	260	°C

*Maximum Ratings are those values beyond which damage to the device may occur.

†Temperature Derating: Plastic "P and D/DW" Packages: -7.0 mW/°C From 65°C To 125°C

Ceramic "L" Packages: -12 mW/°C From 100°C To 125°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range V_{SS} ≤ (V_{in} or V_{out}) ≤ V_{DD}.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.

MC14067 TRUTH TABLE

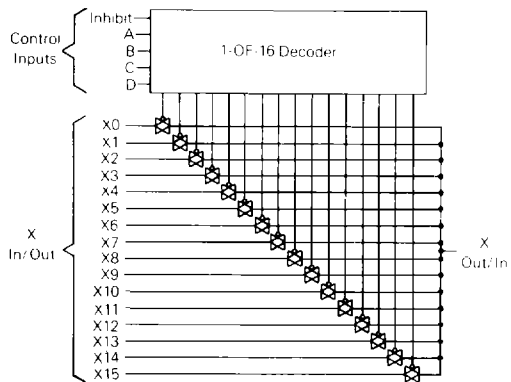
Control Inputs					Selected Channel
A	B	C	D	Inh	
X	X	x	X	1	None
0	0	0	0	0	X0
1	0	0	0	0	X1
0	1	0	0	0	X2
1	1	0	0	0	X3
0	0	1	0	0	X4
1	0	1	0	0	X5
0	1	1	0	0	X6
1	1	1	0	0	X7
0	0	0	1	0	X8
1	0	0	1	0	X9
0	1	0	1	0	X10
1	1	0	1	0	X11
0	0	1	1	0	X12
1	0	1	1	0	X13
0	1	1	1	0	X14
1	1	1	1	0	X15

MC14097 TRUTH TABLE

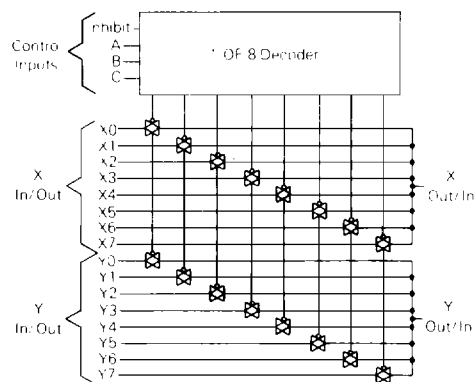
Control Inputs				Selected Channels
A	B	C	Inh	
X	x	x	1	None
0	0	0	0	X0 Y0
1	0	0	0	X1 Y1
0	1	0	0	X2 Y2
1	1	0	0	X3 Y3
0	0	1	0	X4 Y4
1	0	1	0	X5 Y5
0	1	1	0	X6 Y6
1	1	1	0	X7 Y7

X = Don't Care

MC14067 FUNCTIONAL DIAGRAM



MC14097 FUNCTIONAL DIAGRAM



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MC14067B-MC14097B

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V _{DD}	Test Conditions	-55°C		25°C			125°C		Unit	
				Min	Max	Min	Typ #	Max	Min	Max		
SUPPLY REQUIREMENTS (Voltages Referenced to V _{SS})												
Power Supply Voltage Range	V _{DD}	—		3.0	18	3.0	—	18	3.0	18	V	
Quiescent Current Per Package	I _{DD}	5.0 10 15	Control Inputs: V _{in} = V _{SS} or V _{DD} . Switch I/O: V _{SS} ≤ V _{I/O} ≤ V _{DD} , and ΔV _{switch} ≤ 500 mV**	— — —	5.0 10 20	— — —	0.005 0.010 0.015	5.0 10 20	— — —	150 300 600	μA	
Total Supply Current (Dynamic Plus Quiescent, Per Package)	I _{D(AV)}	5.0 10 15	T _A = 25°C only (The channel component, (V _{in} - V _{out})/R _{on} , is not included.)	Typical (0.07 μA/kHz)f + I _{DD} (0.20 μA/kHz)f + I _{DD} (0.36 μA/kHz)f + I _{DD}								μA
CONTROL INPUTS — INHIBIT, A, B, C, D (Voltages Referenced to V _{SS})												
Low-Level Input Voltage	V _{IL}	5.0 10 15	R _{on} = per spec. I _{off} = per spec	— — —	1.5 3.0 4.0	— — —	2.25 4.50 6.75	1.5 3.0 4.0	— — —	1.5 3.0 4.0	V	
High-Level Input Voltage	V _{IH}	5.0 10 15	R _{on} = per spec. I _{off} = per spec	3.5 7.0 11	— — —	3.5 7.0 11	2.75 5.50 8.25	— — —	3.5 7.0 11	— — —	V	
Input Leakage Current	I _{in}	15	V _{in} = 0 or V _{DD}	—	±0.1	—	±0.00001	±0.1	—	±1.0	μA	
Input Capacitance	C _{in}	—		—	—	—	5.0	7.5	—	—	pF	
SWITCHES IN/OUT AND COMMONS OUT/IN — X, Y (Voltages Referenced to V _{SS})												
Recommended Peak-to-Peak Voltage Into or Out of the Switch	V _{I/O}	—	Channel On or Off	0	V _{DD}	0	—	V _{DD}	0	V _{DD}	V _{p-p}	
Recommended Static or Dynamic Voltage Across the Switch** (Figure 1)	ΔV _{switch}	—	Channel On	0	600	0	—	600	0	300	mV	
Output Offset Voltage	V _{OO}	—	V _{in} = 0 V, No Load	—	—	—	10	—	—	—	μV	
ON Resistance	R _{on}	5.0 10 15	ΔV _{switch} ≤ 500 mV**, V _{in} = V _{IL} or V _{IH} (Control), and V _{in} = 0 to V _{DD} (Switch)	— — —	800 400 220	— — —	250 120 80	1050 500 280	— — —	1300 550 320	Ω	
ΔON Resistance Between Any Two Channels in the Same Package	ΔR _{on}	5.0 10 15		— — —	70 50 45	— — —	25 10 10	70 50 45	— — —	135 95 65	Ω	
Off-Channel Leakage Current (Figure 2)	I _{off}	15	V _{in} = V _{IL} or V _{IH} (Control) Channel to Channel or Any One Channel	—	±100	—	±0.05	±100	—	±1000	nA	
Capacitance, Switch I/O	C _{I/O}	—	Inhibit = V _{DD}	—	—	—	10	—	—	—	pF	
Capacitance, Common O/I	C _{O/I}	—	Inhibit = V _{DD} (MC14067B) (MC14097B)	—	—	—	100 60	—	—	—	pF	
Capacitance, Feedthrough (Channel Off)	C _{I/O}	—	Pins Not Adjacent Pins Adjacent	—	—	—	0.47	—	—	—	pF	

#Data labeled "Typ" is not to be used for design purposes, but is intended as an indication of the IC's potential performance.
 **For voltage drops across the switch (ΔV_{switch}) >600 mV (>300 mV at high temperature), excessive V_{DD} current may be drawn; i.e. the current out of the switch may contain both V_{DD} and switch input components. The reliability of the device will be unaffected unless the Maximum Ratings are exceeded. (See first page of this data sheet.)

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MC14067B·MC14097B

ELECTRICAL CHARACTERISTICS ($C_L = 50$ pF, $T_A = 25^\circ\text{C}$)

Characteristic	Symbol	V _{DD} - V _{SS} V _{dc}	Typ #	Max	Unit	
Propagation Delay Times Channel Input-to-Channel Output ($R_L = 200\text{ k}\Omega$) MC14067B	t _{PLH} , t _{PHL} (Figure 3)	5.0	35	90	ns	
		10	15	40		
		15	12	30		
	MC14097B		5.0	25	65	ns
			10	10	25	
			15	7	18	
Control Input-to-Channel Output Channel Turn-On Time ($R_L = 10$ k Ω) MC14067B/097B	t _{PZH} , t _{PZL} (Figure 4)	5.0	240	600	ns	
10	115	290				
15	75	190				
Channel Turn-Off Time ($R_L = 300$ k Ω) MC14067B/097B	t _{PHZ} , t _{PLZ} (Figure 4)	5.0	250	625	ns	
10	120	300				
15	75	190				
Any Pair of Address Inputs to Output MC14067B	t _{PLH} , t _{PHL} (Figure 10)	5.0	280	700	ns	
		10	115	290		
		15	85	215		
	MC14097B		5.0	250	625	ns
			10	100	250	
			15	75	190	
Second Harmonic Distortion ($R_L = 10$ k Ω , $f = 1$ kHz, $V_{in} = 5$ V _{p-p})	—	10	0.3	—	%	
ON Channel Bandwidth [$R_L = 1$ k Ω , $V_{in} = 1/2$ (V _{DD} - V _{SS}) p-p(sine-wave)] $20 \text{ Log}_{10} \frac{V_{out}}{V_{in}} = -3$ dB	BW (Figure 5)	10	15	—	MHz	
		10	25	—		
Off Channel Feedthrough Attenuation [$R_L = 1$ k Ω , $V_{in} = 1/2$ (V _{DD} - V _{SS}) p-p(sine-wave)] $f_{in} = 20$ MHz - MC14067B $f_{in} = 12$ MHz - MC14097B	— (Figure 5)	10	-40	—	dB	
Channel Separation [$R_L = 1$ k Ω , $V_{in} = 1/2$ (V _{DD} - V _{SS}) p-p(sine-wave)] $f_{in} = 20$ MHz	— (Figure 6)	10	-40	—	dB	
Crosstalk, Control Inputs-to-Common O/I ($R_1 = 1$ k Ω , $R_L = 10$ k Ω , Control $t_r = t_f = 20$ ns, Inhibit = V _{SS})	— (Figure 7)	10	30	—	mV	

#Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

MC14067B·MC14097B

FIGURE 1 — ΔV ACROSS SWITCH

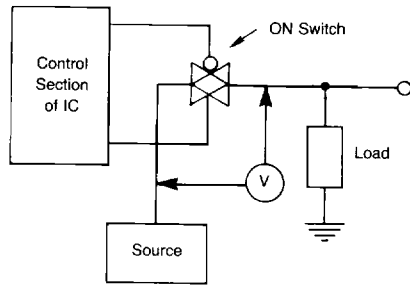
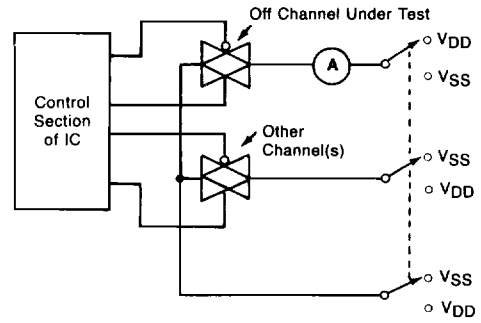
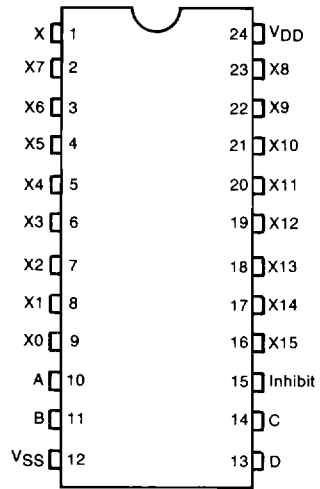


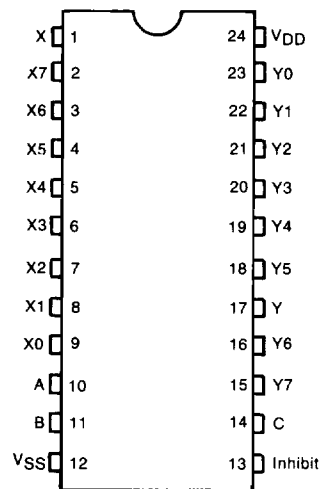
FIGURE 2 — OFF CHANNEL LEAKAGE



**MC14067B
PIN ASSIGNMENT**



**MC14097B
PIN ASSIGNMENT**



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FIGURE 3 — PROPAGATION DELAY TEST CIRCUIT AND WAVEFORMS V_{in} to V_{out}

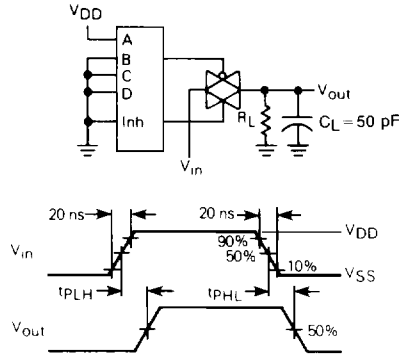


FIGURE 4 — TURN-ON AND DELAY TURN-OFF TEST CIRCUIT AND WAVEFORMS

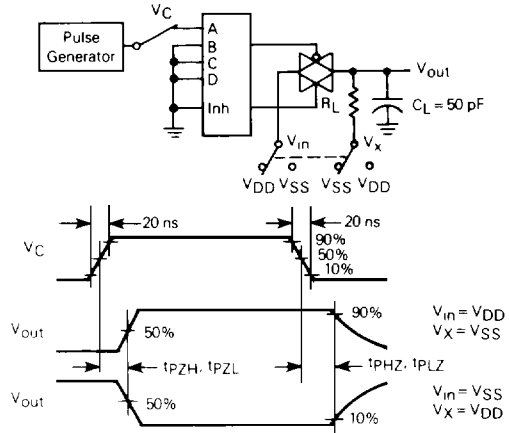


FIGURE 5 — BANDWIDTH AND OFF-CHANNEL FEEDTHROUGH ATTENUATION

A, B, and C inputs used to turn ON or OFF the switch under test

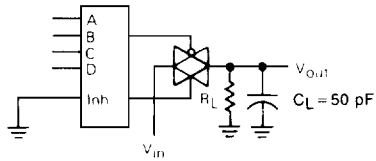
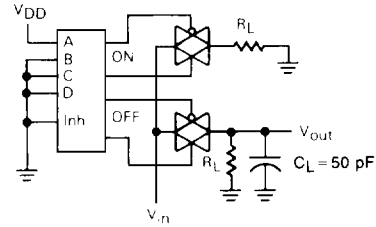
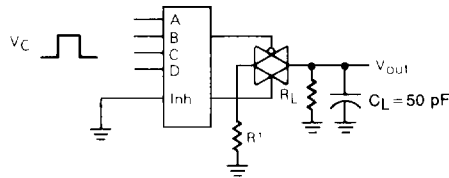


FIGURE 6 — CHANNEL SEPARATION (Adjacent Channels Used for Setup)



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FIGURE 7 — CROSSTALK, CONTROL TO COMMON O/I



MC14067B-MC14097B

FIGURE 9 — CHANNEL RESISTANCE (R_{ON}) TEST CIRCUIT

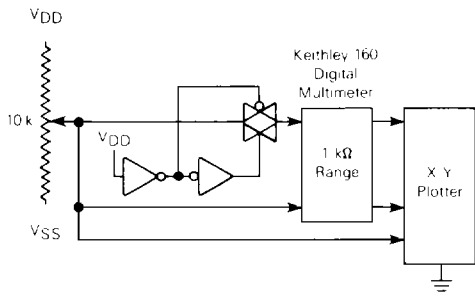
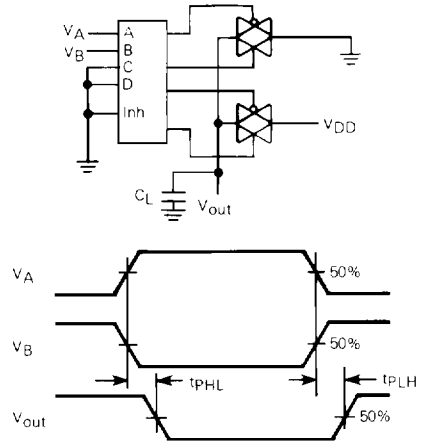


FIGURE 10 — PROPAGATION DELAY, ANY PAIR OF ADDRESS INPUTS to OUTPUT



TYPICAL RESISTANCE CHARACTERISTICS

FIGURE 11 — $V_{DD} = 7.5\text{ V}$, $V_{SS} = -7.5\text{ V}$

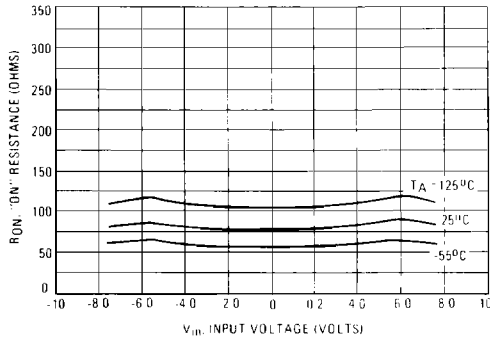


FIGURE 12 — $V_{DD} = 5.0\text{ V}$, $V_{SS} = -5.0\text{ V}$

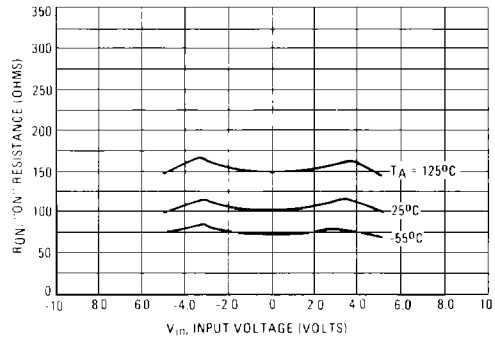


FIGURE 13 — $V_{DD} = 2.5\text{ V}$, $V_{SS} = -2.5\text{ V}$

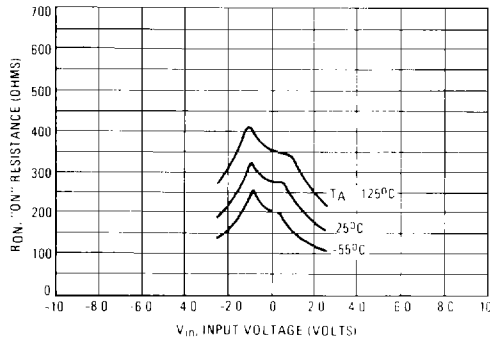
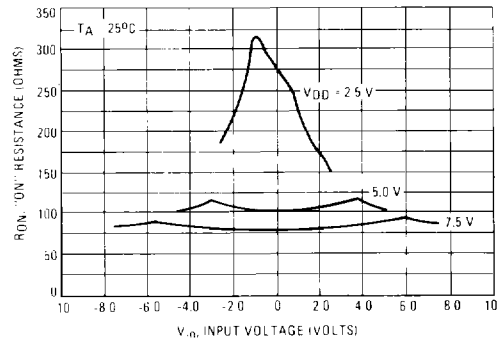


FIGURE 14 — COMPARISON AT 25°C, $V_{DD} = -V_{SS}$



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MC14067B-MC14097B

APPLICATIONS INFORMATION

Figure A illustrates use of the Analog Multiplexer/Demultiplexer. The 0-to-5 volt Digital Control signal is used to directly control a 5 V_{p-p} analog signal.

The digital control logic levels are determined by V_{DD} and V_{SS}. The V_{DD} voltage is the logic high voltage; the V_{SS} voltage is logic low. For the example, V_{DD} = +5 V = logic high at the control inputs; V_{SS} = GND = 0 V = logic low.

The maximum analog signal level is determined by V_{DD} and V_{SS}. The analog voltage must swing neither higher than V_{DD} nor lower than V_{SS}. The example

shows a 5 V_{p-p} signal which allows no margin at either peak. If voltage transients above V_{DD} and/or below V_{SS} are anticipated on the analog channels, external diodes (D_x) are recommended as shown in Figure B. These diodes should be small signal types able to absorb the maximum anticipated current surges during clipping.

The *absolute* maximum potential difference between V_{DD} and V_{SS} is 18.0 volts. Most parameters are specified up to 15 V which is the *recommended* maximum difference between V_{DD} and V_{SS}.

FIGURE A — APPLICATION EXAMPLE

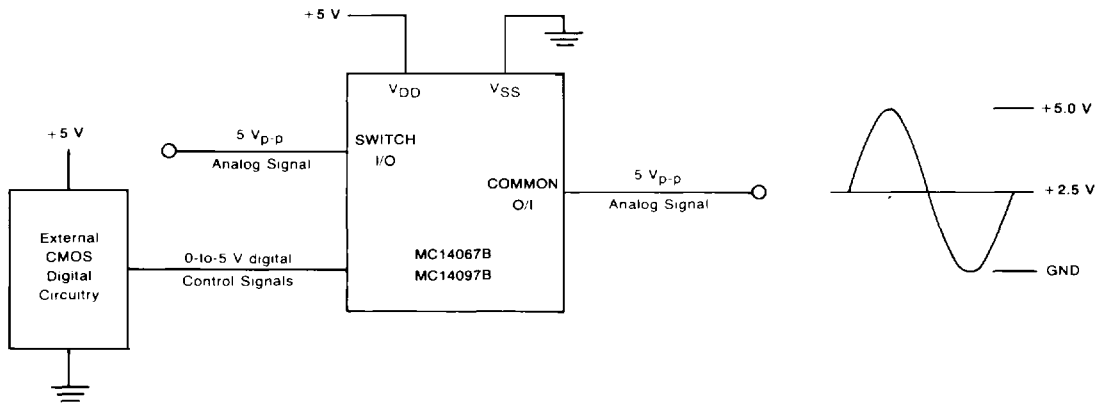


FIGURE B — EXTERNAL GERMANIUM OR SCHOTTKY CLIPPING DIODES

