AH0014/AH0014C* DPDT, AH0015/AH0015C Quad SPST, AH0019/AH0019C* Dual DPST-TTL/DTL Compatible MOS Analog Switches

General Description

This series of TTL/DTL compatible MOS analog switches feature high speed with internal level shifting and driving. The package contains two monolithic integrated circuit chips: the MOS analog chip is similar to the MM450 type which consists of four MOS analog switch transistors; the second chip is a bipolar I.C. gate and level shifter. The series is available in both hermetic dual-in-line package and flatpack.

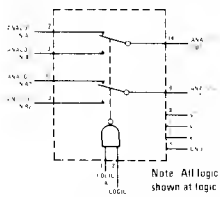
Features

- Large analog voltage switching ±10V
- Fast switching speed 500 ns
- Operation over wide range of power supplies
- Low ON resistance 200Ω
- High OFF resistance $10^{11}\Omega$
- Fully compatible with DTL or TTL logic
- Includes gating and level shifting

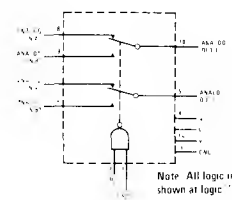
These switches are particularly suited for use in both military and industrial applications such as commutators in data acquisition systems, multiplexers, A/D and D/A converters, long time constant integrators, sample and hold circuits, modulators/demodulators, and other analog signal switching applications. For information on other National analog switches and analog interface elements, see listing on last page.

The AH0014, AH0015 and AH0019 are specified for operation over the −55°C to +125°C military temperature range. The AH0014C, AH0015C and AH0019C are specified for operation over the −25°C to +85°C temperature range.

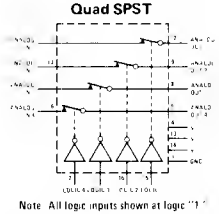
Block and Connection Diagrams



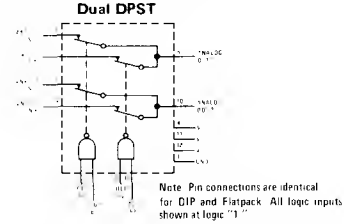
Order Number AH0014F or AH0014CF
See Package 23
Quad SPST



Order Number AH0014D or AH0014CD
See Package 14
Dual DPST



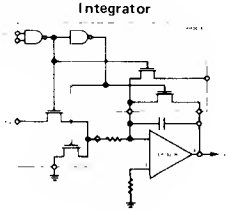
Order Number AH0015D or AH0015CD
See Package 15



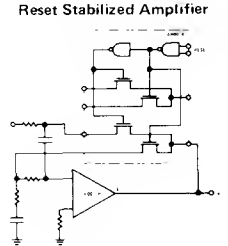
Order Number AH0019F or AH0019CF
See Package 23
Order Number AH0019D or AH0019CD
See Package 14

Typical Applications

Integrator



Reset Stabilized Amplifier



*Previously called NH0014/NH0014C and NH0019/NH0019C

Absolute Maximum Ratings

V_{CC} Supply Voltage	7.0V
V^- Supply Voltage	-30V
V^+ Supply Voltage	+30V
V^+/V^- Voltage Differential	40V
Logic Input Voltage	5.5V
Storage Temperature Range	-65°C to +150°C
Operating Temperature Range	
AH0014, AH0015, AH0019	-55°C to +125°C
AH0014C, AH0015C, AH0019C	-25°C to +85°C
Lead Temperature (Soldering, 10 sec)	300°C

Electrical Characteristics (Notes 1 and 2)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Logical "1" Input Voltage	V_{CC} = 4.5V	2.0			V
Logical "0" Input Voltage	V_{CC} = 4.5V			0.8	V
Logical "1" Input Current	V_{CC} = 5.5V V_{IN} = 2.4V			5	μA
Logical "1" Input Current	V_{CC} = 5.5V V_{IN} = 5.5V			1	mA
Logical "0" Input Current	V_{CC} = 5.5V V_{IN} = 0.4V		0.2	0.4	mA
Power Supply Current Logical "1" Input – each gate (Note 3)	V_{CC} = 5.5V V_{IN} = 4.5V		0.85	1.6	mA
Power Supply Current Logical "0" Input – each gate (Note 3)	V_{CC} = 5.5V V_{IN} = 0V				
AH0014, AH0014C			1.5	3.0	mA
AH0015, AH0015C			0.22	0.41	mA
AH0019, AH0019C			0.22	0.41	mA
Analog Switch ON Resistance – each gate	V_{IN} (Analog) = +10V		75	200	Ω
	V_{IN} (Analog) = -10V		150	600	Ω
Analog Switch OFF Resistance			10^{11}		Ω
Analog Switch Input Leakage Current – each input (Note 4)	V_{IN} = -10V				
AH0014, AH0015, AH0019	T_A = 25°C		25	200	pA
	T_A = 125°C		25	200	nA
AH0014C, AH0015C, AH0019C	T_A = 25°C		0.1	10	nA
	T_A = 70°C		30	100	nA
Analog Switch Output Leakage Current – each output (Note 4)	V_{OUT} = -10V				
AH0014, AH0015, AH0019	T_A = 25°C		40	400	pA
	T_A = 125°C		40	400	nA
AH0014C, AH0015C, AH0019C	T_A = 25°C		0.05	10	nA
	T_A = 70°C		4	50	nA
Analog Input (Drain) Capacitance	1 MHz @ Zero Bias		8	10	pF
Output Source Capacitance	1 MHz @ Zero Bias		11	13	pF
Analog Turn OFF Time – t_{OFF}	See test circuit; T_A = 25°C		400	500	ns
Analog Turn ON Time – t_{ON}	See test circuit; T_A = 25°C				
AH0014, AH0014C			350	425	ns
AH0015, AH0015C			100	150	ns
AH0019, AH0019C			100	150	ns

Note 1: Min/max limits apply across the guaranteed temperature range of -55 C to +125 C for AH0014, AH0015, AH0019 and -25 C to +85 C for AH0014C, AH0015C, AH0019C V^- = -20V V^+ = +10V and an analog test current of 1 mA unless otherwise specified

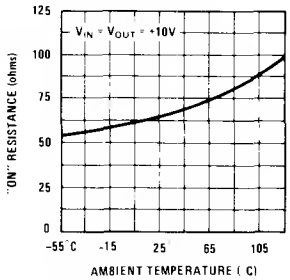
Note 2: All typical values are measured at T_A = 25°C with V_{CC} = 5.0V V^+ = +10V, V^- = -22V.

Note 3: Current measured is drawn from V_{CC} supply

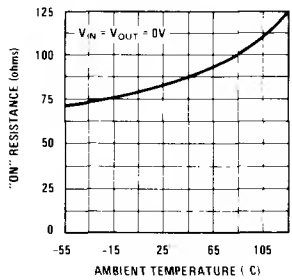
Note 4: All analog switch pins except measurement pin are tied to V^+

Analog Switch Characteristics (Note 2)

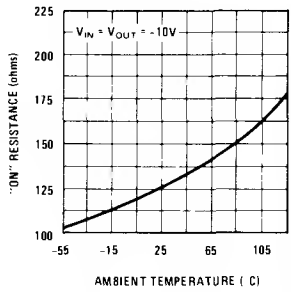
R_{ON} vs Temperature



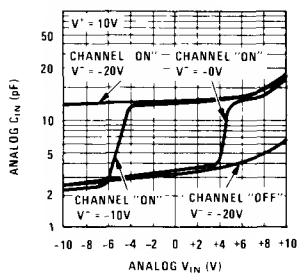
R_{ON} vs Temperature



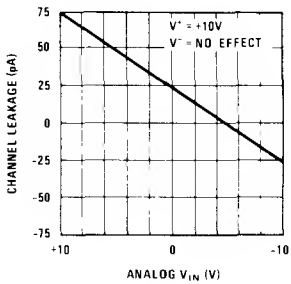
R_{ON} vs Temperature



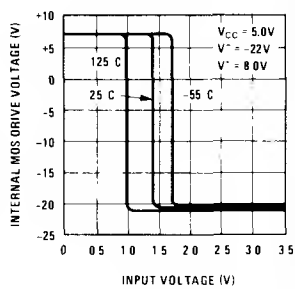
C_{IN} vs V_{IN}



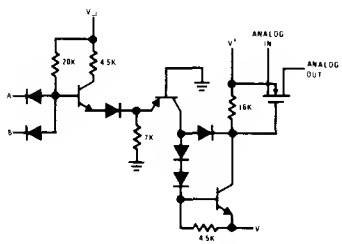
Leakage vs V_{IN} (Channel "OFF")



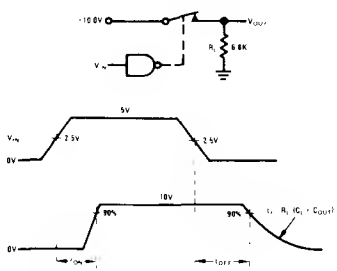
Driver Gate V_{IN} vs V_{OUT}



Schematic (Single Driver Gate and MOS Switch Shown)

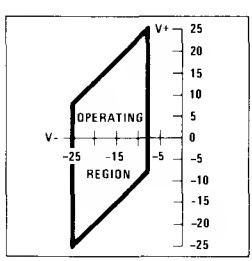


Analog Switching Time Test Circuit



Selecting Power Supply Voltage

The graph shows the boundary conditions which must be used for proper operation of the unit. The range of operation for power supply V^- is shown on the X axis. It must be between −25V and −8V. The allowable range for power supply V^+ is governed by supply V^-. With a value chosen for V^-, V^+ may be selected as any value along a vertical line passing through the V^- value and terminated by the boundaries of the operating region. A voltage difference between power supplies of at least 5V should be maintained for adequate signal swing.



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