

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 hermetic dual-in-line package.

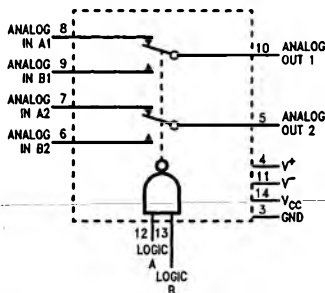
These switches are particularly suited for use in both military and industrial applications such as commutators in data acquisition systems, multiplexers, A/D and D/A converters, long time constant integrators, sample and hold circuits, modulators/demodulators, and other analog signal switching applications.

The AH0014, AH0015 and AH0019 are specified for operation over the -55°C to $+125^{\circ}\text{C}$ military temperature range. The AH0014C, AH0015C and AH0019C are specified for operation over the -25°C to $+85^{\circ}\text{C}$ temperature range.

Features

- Large analog voltage switching $\pm 10\text{V}$
- Fast switching speed 500 ns
- Operation over wide range of power supplies
- Low ON resistance 200 Ω
- High OFF resistance $10^{11}\Omega$
- Analog signals in excess of 25 MHz
- Fully compatible with DTL or TTL logic
- Includes gating and level shifting

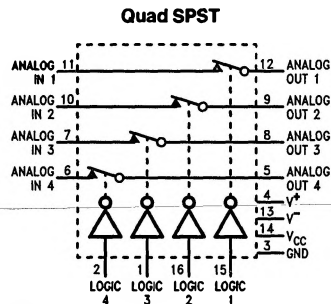
Block and Connection Diagrams



Note: All logic inputs shown at logic "1".

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Order Number AH0014D or AH0014CD
See NS Package Number D14D

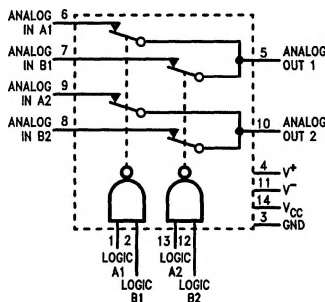


Note: All logic inputs shown at logic "1".

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Order Number AH0015D or AH0015CD
See NS Package Number D16C

Dual DPST



Note: All logic inputs shown at logic "1".

TL/K/10125-3

Order Number AH0019D or AH0019CD
See NS Package Number D14D

*Previously called NH0014/NH0014C and NH0019/NH0019C

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

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	μA
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	$V_{IN} \text{ (Analog)} = +10V$ $V_{IN} \text{ (Analog)} = -10V$		75 150	200 600	Ω Ω
Analog Switch OFF Resistance			10^{11}		Ω
Analog Switch Input Leakage Current—Each Input (Note 4)	$V_{IN} = -10V$				
AH0014, AH0015, AH0019	$T_A = 25^\circ C$		25	200	pA
	$T_A = 125^\circ C$		25	200	nA
AH0014C, AH0015C, AH0019C	$T_A = 25^\circ C$		0.1	10	nA
	$T_A = 70^\circ C$		30	100	nA
Analog Switch Output Leakage Current—Each Output (Note 4)	$V_{OUT} = -10V$				
AH0014, AH0015, AH0019	$T_A = 25^\circ C$		40	400	pA
	$T_A = 125^\circ C$		40	400	nA
AH0014C, AH0015C, AH0019C	$T_A = 25^\circ C$		0.05	10	nA
	$T_A = 70^\circ C$		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; $T_A = 25^\circ C$		600	750	ns
Analog Turn-ON Time— t_{ON}	See Test Circuit; $T_A = 25^\circ C$				
AH0014, AH0014C			350	425	ns
AH0015, AH0015C			100	150	ns
AH0019, AH0019C			100	150	ns

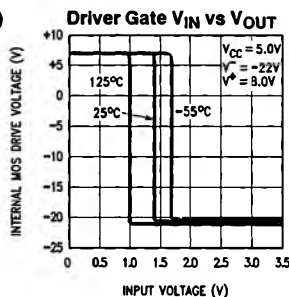
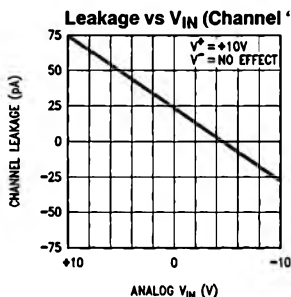
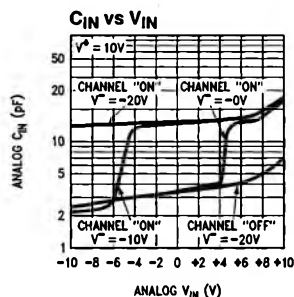
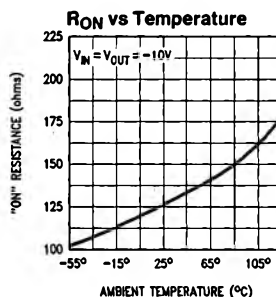
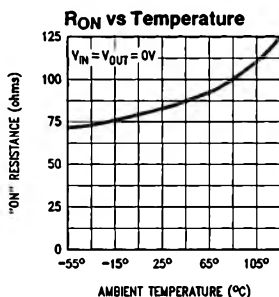
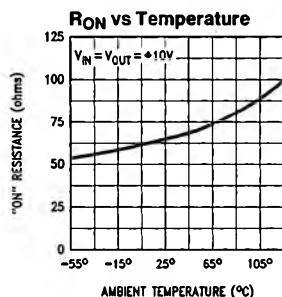
Note 1: Min/max limits apply across the guaranteed temperature range of -55°C to +125°C for AH0014, AH0015, AH0019 and -25°C to +85°C for AH0014C, AH0015C, AH0019C. $V^- = -20V$. $V^+ = +10V$ and an analog test current of 1 mA unless otherwise specified.

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

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

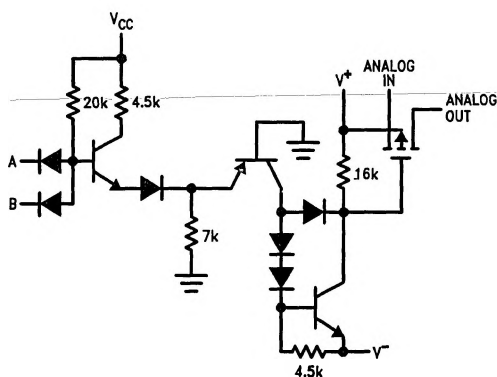
Note 4: All analog switch pins except measurement pin are tied to V^+ .

Analog Switch Characteristics (Note 2)



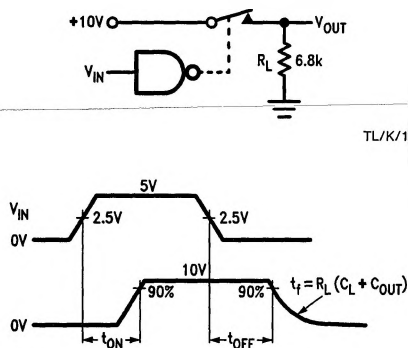
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Schematic (Single Driver Gate and MOS Switch Shown)



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Analog Switching Time Test Circuit

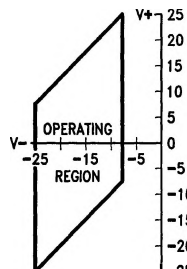


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Selecting Power Supply Voltage

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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Typical Applications

