

February 1995

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.

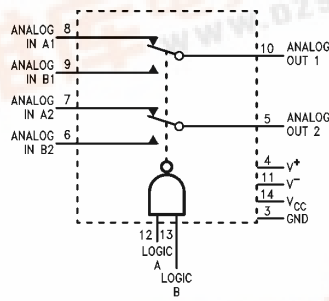
These switches are particularly suited for use in both military and industrial applications such as commutators in data acquisition systems, multiplexers, A/D and D/A converters, long time constant integrators, sample and hold circuits, modulators/demodulators, and other analog signal switching applications.

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.

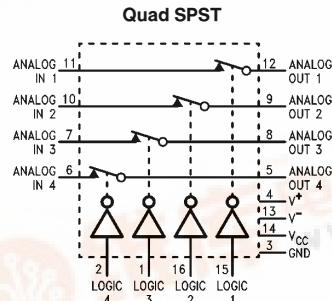
Features

- 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

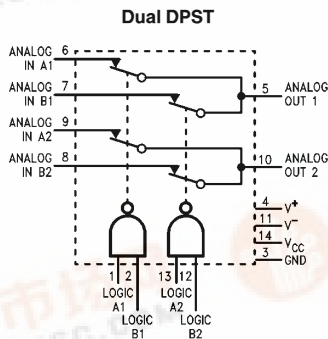
Block and Connection Diagrams



Note: All logic inputs shown at logic "1".
 TL/K/10125-1
Order Number AH0014D or AH0014CD
 See NS Package Number D14D



Note: All logic inputs shown at logic "1".
 TL/K/10125-2
Order Number AH0015D or AH0015CD
 See NS Package Number D16C



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

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



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
Analogue Switch ON Resistance—Each Gate	V _{IN} (Analog) = +10V V _{IN} (Analog) = -10V		75 150	200 600	Ω Ω
Analogue Switch OFF Resistance			10 ¹¹		Ω
Analogue 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
Analogue 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
Analogue Input (Drain) Capacitance	1 MHz @ Zero Bias		8	10	pF
Output Source Capacitance	1 MHz @ Zero Bias		11	13	pF
Analogue Turn-OFF Time—t _{OFF}	See Test Circuit; T _A = 25°C		600	750	ns
Analogue 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

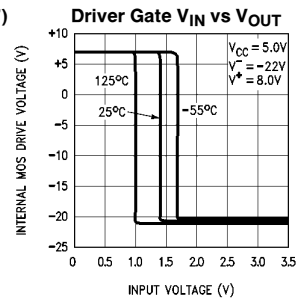
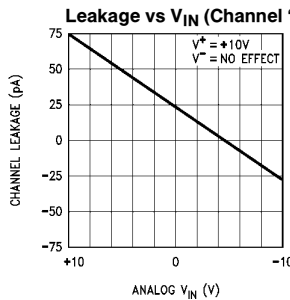
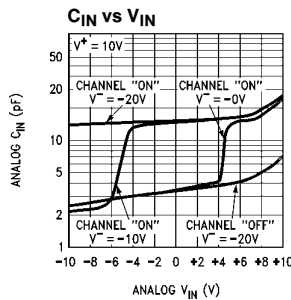
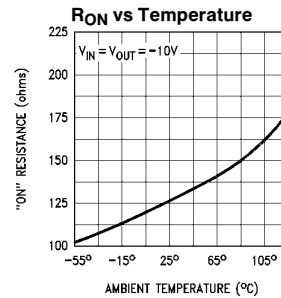
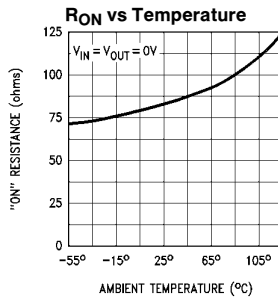
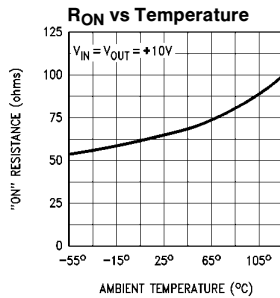
Note 1: Min/max limits apply across the guaranteed temperature range of -55°C to +125°C for AH0014, AH0015, AH0019 and -25°C to +85°C for AH0014C, AH0015C, AH0019C. V⁻ = -20V. V⁺ = +10V and an analogue test current of 1 mA unless otherwise specified.

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.

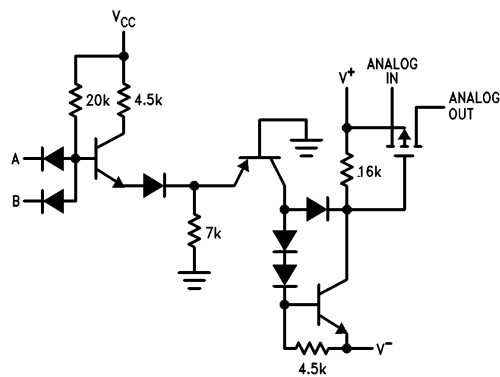
Note 4: All analogue switch pins except measurement pin are tied to V⁺.

Analog Switch Characteristics (Note 2)



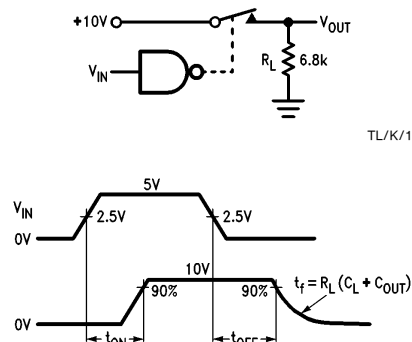
TL/K/10125-6

Schematic (Single Driver Gate and MOS Switch Shown)



TL/K/10125-7

Analog Switching Time Test Circuit

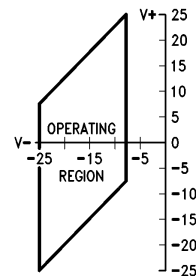


TL/K/10125-8

TL/K/10125-9

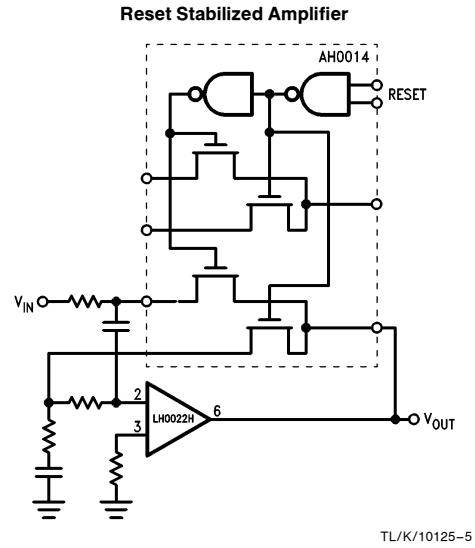
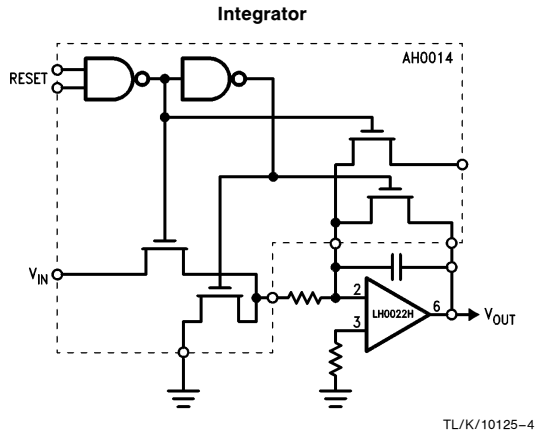
Selecting Power Supply Voltage

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.

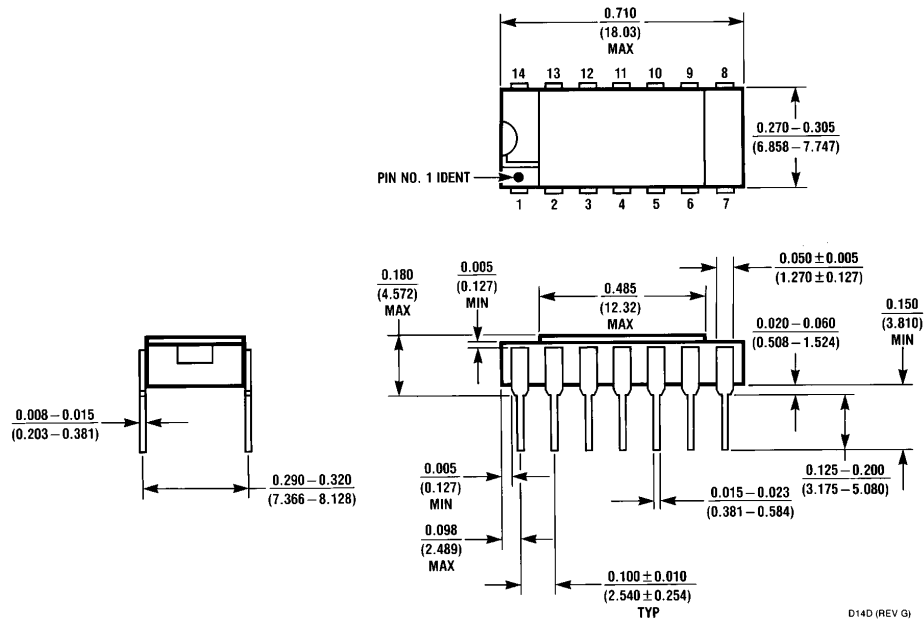


TL/K/10125-10

Typical Applications



Physical Dimensions inches (millimeters)

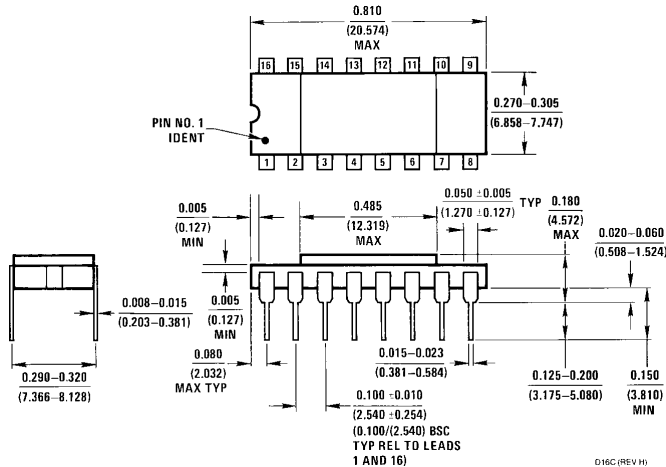


D14D (REV G)

14 Lead Hermetic Dual-In-Line Package (D)
Order Number AH0014D, AH0014CD, AH0019D or AH0019CD
NS Package Number D14D

Physical Dimensions inches (millimeters) (Continued)

Lit. # 101021



16 Lead Hermetic Dual-In-Line Package (D)
Order Number AH0015D or AH0015CD
NS Package Number D16C

D16C (REV H)

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



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