

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.

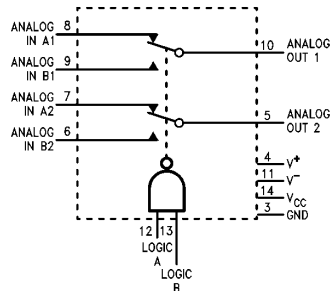
These switches are particularly suited for use in both military and industrial applications such as commutators in data acquisition systems, multiplexers, A/D and D/A converters, long time constant integrators, sample and hold circuits, modulators/demodulators, and other analog signal switching applications.

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

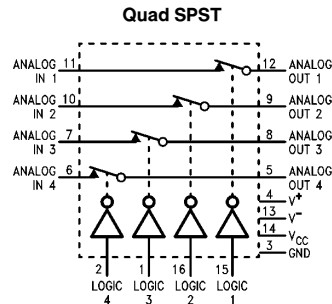
- Large analog voltage switching $\pm 10\text{V}$
- Fast switching speed 500 ns
- Operation over wide range of power supplies
- Low ON resistance 200 Ω
- High OFF resistance 10¹¹ Ω
- Analog signals in excess of 25 MHz
- Fully compatible with DTL or TTL logic
- Includes gating and level shifting

Block and Connection Diagrams



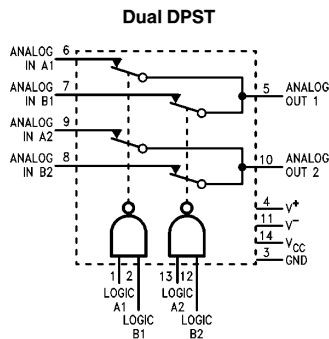
Note: All logic inputs shown at logic "1". TL/K/10125-1

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".

Order Number AH0019D or AH0019CD
See NS Package Number D14D

TL/K/10125-3

*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
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

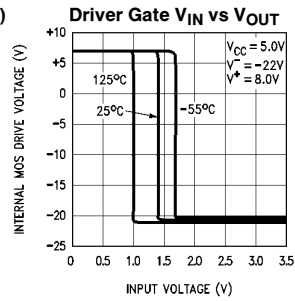
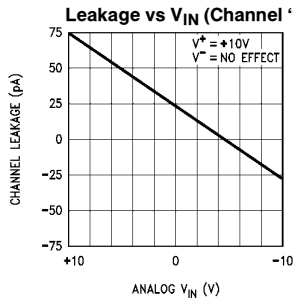
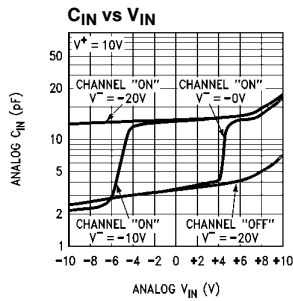
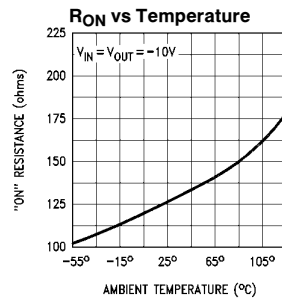
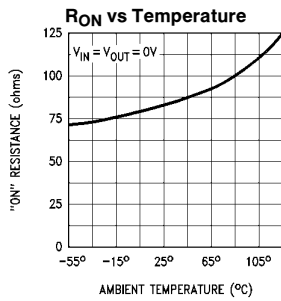
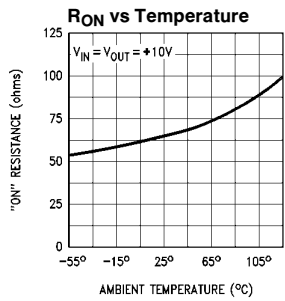
Note 1: Min/max limits apply across the guaranteed temperature range of -55°C to +125°C for AH0014, AH0015, AH0019 and -25°C to +85°C for AH0014C, AH0015C, AH0019C. V⁻ = -20V. V⁺ = +10V and an analogue test current of 1 mA unless otherwise specified.

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.

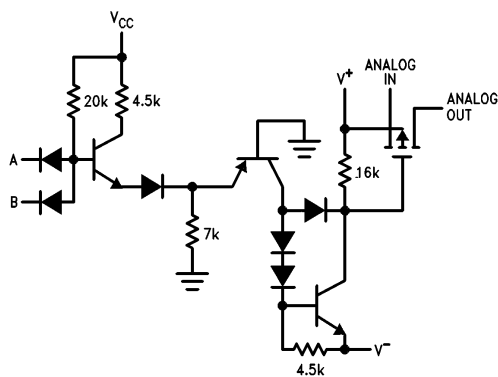
Note 4: All analogue switch pins except measurement pin are tied to V⁺.

Analog Switch Characteristics (Note 2)



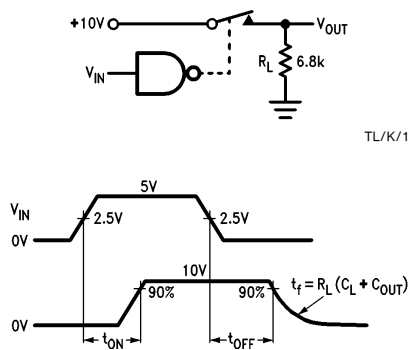
TL/K/10125-6

Schematic (Single Driver Gate and MOS Switch Shown)



TL/K/10125-7

Analog Switching Time Test Circuit

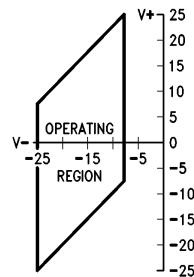


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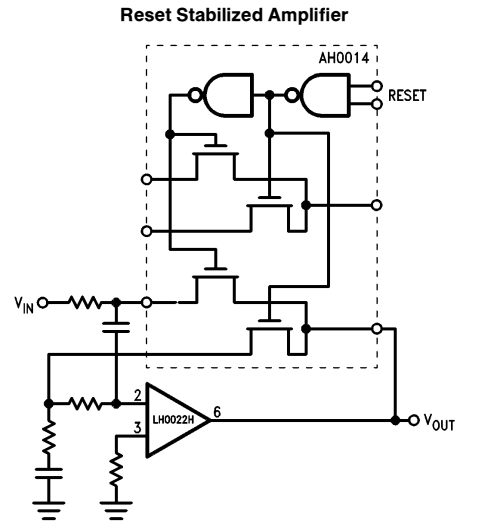
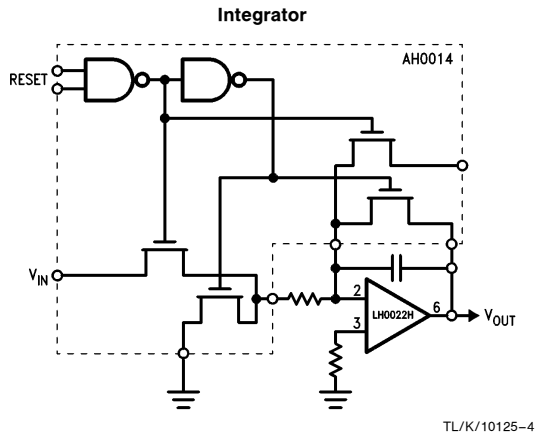
Selecting Power Supply Voltage

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.

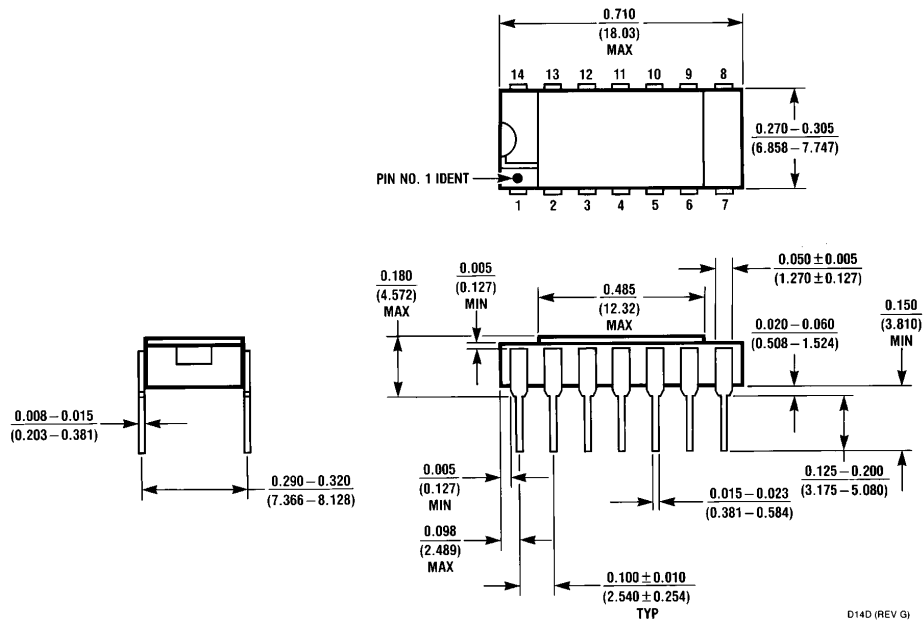


TL/K/10125-10

Typical Applications



Physical Dimensions inches (millimeters)

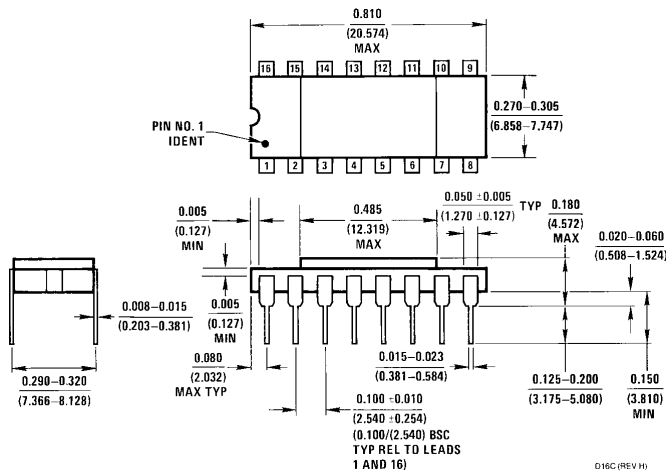


14 Lead Hermetic Dual-In-Line Package (D)
Order Number AH0014D, AH0014CD, AH0019D or AH0019CD
NS Package Number D14D

D14D (REV G)

Physical Dimensions inches (millimeters) (Continued)

Lit. # 101021



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

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