19-0215; Rev. 1; 12/92

MAXIM

CMOS Analog Switches

General Description

Maxim's IH5048-IH5051 analog switches are designed for applications requiring low leakage. They feature extremely low on resistance (30Ω typical) as well as quiescent power-supply current below 1µA. Switch control inputs are fully compatible with both CMOS and TTL logic.

These switches are plug-in upgrades for the original manufacturer's devices, with improved specifications for analog-signal range and switch on and off times. They are also pin-compatible with the IH5040 family of analog switches. The IH5048 series is supplied in 16-pin DIP and SO packages.

Applications

Precision Sample-and-Hold Circuits
Transducer and Sensor Switching
Low-Level Signal Conditioning
Battery-Powered Instrumentation
Programmable-Gain Amplifiers

Features

- ♦ Low Charge Injection (10pC Typ)
- ♦ Quiescent Current Below 1mA
- ♦ TTL and CMOS Compatible
- ♦ Low On Resistance (25Ω Max for IH5048A)
- ♦ Latchup-Proof Construction

Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
IH5048CPE	0°C to +70°C	16 Plastic DIP
IH5048CWE	0°C to +70°C	16 Wide SO
IH5048CJE	0°C to +70°C	16 CERDIP
IH5048C/D	0°C to +70°C	Dice*
IH5048MJE	-55°C to +125°C	16 CERDIP**
IH5048ACPE	0°C to +70°C	16 Plastic DIP
IH5048ACWE	0°C to +70°C	16 Wide SO
IH5048ACJE	0°C to +70°C	16 CERDIP
IH5048AC/D	0°C to +70°C	Dice*
IH5048AMJE	-55°C to +125°C	16 CERDIP**

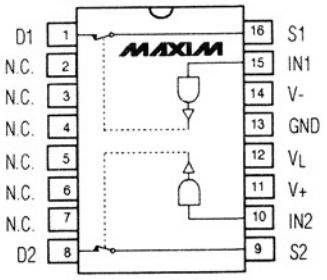
Ordering Information continued on last page.

* *Contact factory for dice specifications.*
** *Contact factory for availability and processing to MIL-STD-883.*

Pin Configurations & Switching-State Diagrams

TOP VIEW

IH5048A - Dual SPST
IH5048 - Dual SPST

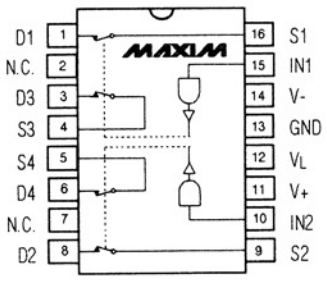


DIP/SO

LOGIC	SWITCH
0	OFF
1	ON

SWITCH STATES ARE FOR LOGIC "1" INPUTS (POSITIVE LOGIC)

IH5049 - Dual SPST



DIP/SO

LOGIC	SWITCH
0	OFF
1	ON

Pin Configurations & Switching-State Diagrams are continued on last page.

CMOS Analog Switches

ABSOLUTE MAXIMUM RATINGS

V+ to V- 36V
V+ to V_D 30V
V_D to V- 30V
V_D to V_S ..... ±28V
V_L to V- 33V
V_L to V_{IN} 30V
V_L to GND 20V
V_{IN} to GND 20V
Current (any terminal) 30mA
Digital Inputs ..... (V+ + 0.3V) to (V+ - 38V)
V_S or V_D (Note 1) ..... -0.3V to (V+ + 0.3V)

Continuous Power Dissipation (T_A = +70°C)
Plastic DIP (derate 10.53mW/°C above +70°C) 842mW
Wide SO (derate 20.00mW/°C above +70°C) 1600mW
CERDIP (derate 10.00mW/°C above +70°C) 800mW
Operating Temperature Ranges:
IH50__C_/IH50__AC_ ..... 0°C to +70°C
IH50__M_/IH50__AM_ ..... -55°C to +125°C
Storage Temperature Range ..... -65°C to +150°C
Lead Temperature (soldering, 10sec) ..... +300°C

Note 1: Signals on S, D, and digital inputs that exceed V- or V+ will be clamped by internal diodes. Limit forward diode current to 30mA maximum.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V+ = 15V, V- = -15V, V_L = 5V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		IH50__M IH50__AM			IH50__C IH50__AC			UNITS
				-55°C	+25°C	+125°C	0°C	+25C	+70C	
Input Logic Current	$I_{IN(ON)}$	V_{IN} = 2.4V		±1	±1	±10	±1	±1	±10	µA
	$I_{IN(OFF)}$	V_{IN} = 0.8V		±1	±1	±10	±1	±1	±10	
Input Logic Low	V_{IL}			0.8	0.8	0.8	0.8	0.8	0.8	V
Input Logic High	V_{IH}			2.4	2.4	2.4	2.4	2.4	2.4	V
Drain-Source On Resistance	$r_{DS(ON)}$	I_S = 10mA, V_D = ±10V	IH5048A only	25	25	35	30	30	45	Ω
			All others	40	40	60	45	45	75	
Channel-to-Channel $r_{DS(ON)}$ Match	$\Delta r_{DS(ON)}$				8 (typ)			8 (typ)		Ω
Minimum Analog Signal Handling Capability	V_{ANALOG}			±14	±14	±14	±14	±14	±14	V
Switch-Off Leakage Current	$I_{D/S(OFF)}$	V_{ANALOG} = -10V to 10V			±1	±100		±5	±100	nA
Switch-On Leakage Current	$I_{D(ON)}$ + $I_{S(ON)}$	V_D = V_S = -10V to 10V			±2	±200		±10	±200	nA
Switch-On Time	t_{ON}	Figure 1			400			600		ns
Switch-Off Time	t_{OFF}	Figure 1			200			300		ns
Charge Injection	Q_{INJ}	Figure 2 (Note 2)			10 (typ)			10 (typ)		pC
Minimum Off-Isolation Rejection Ratio	O_{IRR}	Figure 3, C_L < 5pF			54 (typ)			50 (typ)		dB

ELECTRICAL CHARACTERISTICS (continued)

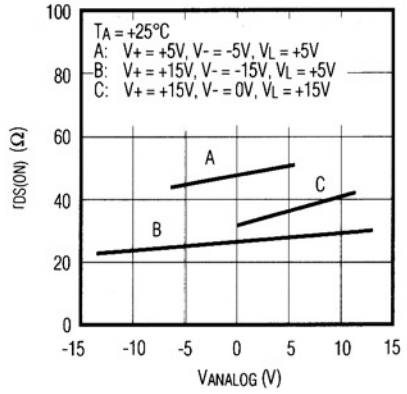
(V+ = 15V, V- = -15V, V_L = 5V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	IH50__M IH50__AM			IH50__C IH50__AC			UNITS
			-55°C	+25°C	+125°C	0°C	+25C	+70C	
V+ Quiescent Current	I_{+Q}	V_{IN} = 0V or 5V	1	1	10	10	10	100	µA
V- Quiescent Current	I_{-Q}	V_{IN} = 0V or 5V	-1	-1	-10	-10	-10	-100	µA
+5V Quiescent Current	I_{LQ}	V_{IN} = 0V or 5V	1	1	10	10	10	100	µA
Ground Quiescent Current	I_{GND}	V_{IN} = 0V or 5V	1	1	10	10	10	100	µA
Minimum Channel-to-Channel Cross-Coupling Rejection Ratio	CCRR	One channel off (Note 2)		54 (typ)			50 (typ)		dB

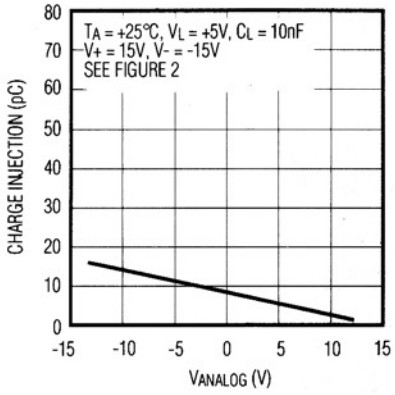
Note 2: Not production tested.

Typical Operating Characteristics

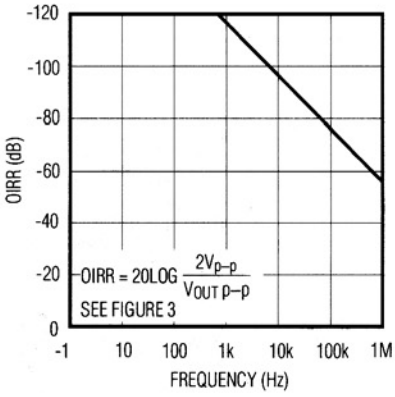
DRAIN-SOURCE ON RESISTANCE vs. ANALOG SIGNAL



CHARGE INJECTION vs. ANALOG SIGNAL



OFF-ISOLATION REJECTION RATIO (OIRR)



Test Circuits

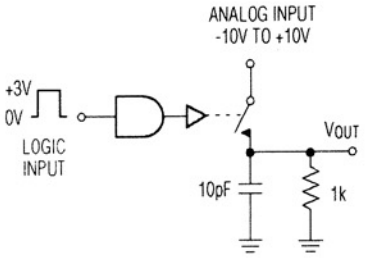


Figure 1. Switching Time

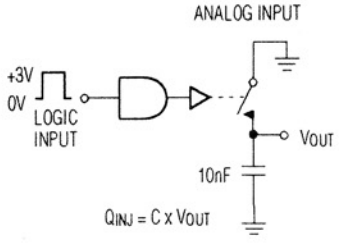


Figure 2. Charge Injection

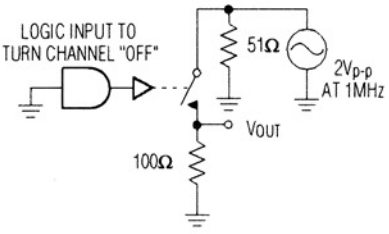


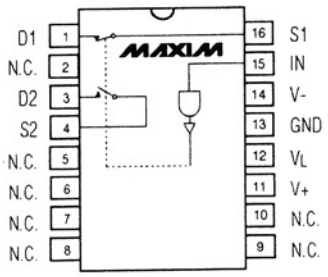
Figure 3. Off-Isolation Rejection Ratio

CMOS Analog Switches

Pin Configurations & Switching-State Diagrams (continued)

TOP VIEW

IH5050 - SPDT

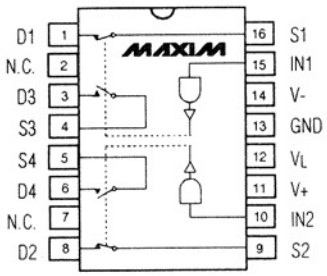


DIP/SO

LOGIC	SWITCH 1	SWITCH 2
0	OFF	ON
1	ON	OFF

SWITCH STATES ARE FOR LOGIC "1" INPUTS (POSITIVE LOGIC)

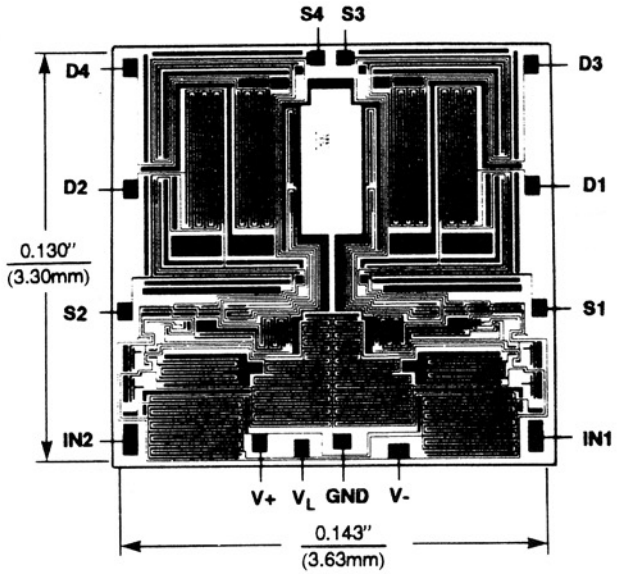
IH5051 - Dual SPDT



DIP/SO

LOGIC	SWITCH 1, SWITCH 2	SWITCH 3, SWITCH 4
0	OFF	ON
1	ON	OFF

Chip Topography



Ordering Information (continued)

PART	TEMP. RANGE	PIN-PACKAGE
IH5049CPE	0°C to +70°C	16 Plastic DIP
IH5049CWE	0°C to +70°C	16 Wide SO
IH5049CJE	0°C to +70°C	16 CERDIP
IH5049C/D	0°C to +70°C	Dice*
IH5049MJE	-55°C to +125°C	16 CERDIP**
IH5050CPE	0°C to +70°C	16 Plastic DIP
IH5050CWE	0°C to +70°C	16 Wide SO
IH5050CJE	0°C to +70°C	16 CERDIP
IH5050C/D	0°C to +70°C	Dice*
IH5050MJE	-55°C to +125°C	16 CERDIP**
IH5051CPE	0°C to +70°C	16 Plastic DIP
IH5051CWE	0°C to +70°C	16 Wide SO
IH5051ACJE	0°C to +70°C	16 CERDIP
IH5051AC/D	0°C to +70°C	Dice*
IH5051MJE	-55°C to +125°C	16 CERDIP**

** Contact factory for dice specifications.*
*** Contact factory for availability and processing to MIL-STD-883.*