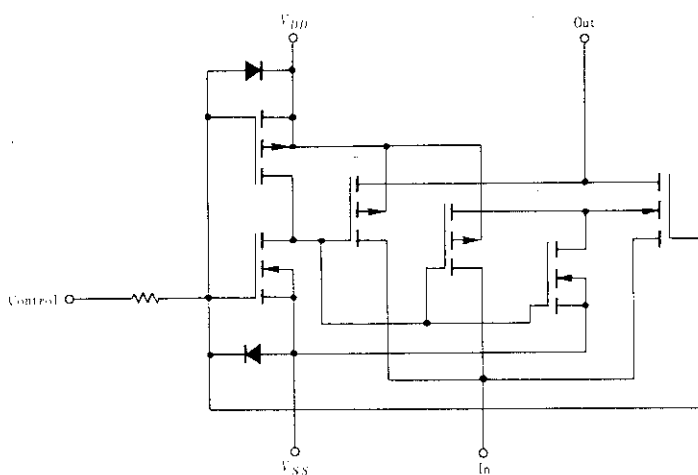


HD14016B

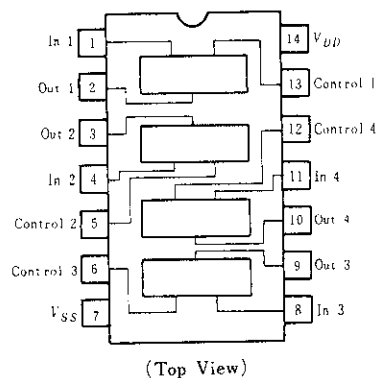
Quadruple Analog Switch/ Quadruple Multiplexer

The HD14016B quad bilateral switch consists of four independent switches capable of controlling either digital or analog signals. The quad bilateral switch is used in signal gating, chopper, modulator, demodulator and CMOS logic implementation.

■ CIRCUIT SCHEMATIC (1/4)



■ PIN ARRANGEMENT



ELECTRICAL CHARACTERISTICS

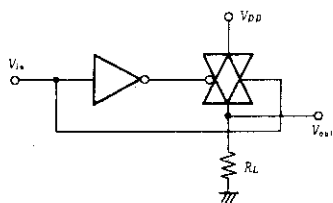
Characteristic	Symbol	Test Circuit	$V_{DD}(V)$	Test Conditions		-40°C		25°C			85°C		Unit		
						min	max	min	typ	max	min	max			
Input Voltage	V_{IL}	1	5.0	$R_L=10k\Omega$	$V_O=1.0V$	—	0.9	—	1.5	0.9	—	0.9	V		
			10	SW Input $=V_{DD}$	$V_O=1.0V$	—	0.9	—	1.5	0.9	—	0.9			
			15		$V_O=1.0V$	—	0.9	—	1.5	0.9	—	0.9			
	V_{IH}		5.0	$R_L=10k\Omega$	$V_O=4.0V$	3.5	—	3.5	2.75	—	3.5	—	V		
			10	SW Input $=V_{DD}$	$V_O=9.0V$	7.0	—	7.0	5.5	—	7.0	—			
			15		$V_O=14V$	11.0	—	11.0	8.25	—	11.0	—			
Input Current		I_{IQ}	15			—	± 0.3	—	± 0.0001	± 0.3	—	± 1.0	μA		
Input Capacitance	Control	C_{in}				—	—	—	5.0	—	—	—	pF		
	Switch Input					—	—	—	5.0	—	—	—			
	Switch Output					—	—	—	5.0	—	—	—			
	Feed Through					—	—	—	0.2	—	—	—			
Quiescent Current		I_{DD}	2	5.0			—	1.0	—	0.0005	1.0	—	7.5	μA	
				10			—	2.0	—	0.0010	2.0	—	15		
				15			—	4.0	—	0.0015	4.0	—	30		
“ON” Resistance		R_{ON}	3	5.0	$V_C=V_{DD}$ $R_L=10k\Omega$	$V_{SS}=-5V$	$V_{in}=-5.0V$	—	610	—	300	660	—	840	Ω
							$V_{in}=-5.0V$	—	610	—	300	660	—	840	
							$V_{in}=\pm 0.25V$	—	610	—	280	660	—	840	
				7.5	$V_{SS}=-7.5V$	$V_{in}=-7.5V$	—	370	—	240	400	—	520		
						$V_{in}=-7.5V$	—	370	—	240	400	—	520		
						$V_{in}=\pm 0.25V$	—	370	—	180	400	—	520		
				10	$V_{SS}=0V$	$V_{in}=+10V$	—	610	—	260	660	—	840		
						$V_{in}=-0.25V$	—	610	—	260	660	—	840		
						$V_{in}=-5.6V$	—	610	—	310	660	—	840		
				15	$V_{SS}=0V$	$V_{in}=+15V$	—	370	—	260	400	—	520		
						$V_{in}=+0.25V$	—	370	—	260	400	—	520		
						$V_{in}=+9.3V$	—	370	—	300	400	—	520		
“ON” Resistance Difference		ΔR_{ON}		5.0	$V_C=V_{DD}$	$V_{in}=\pm 5.0V, V_{SS}=-5V$		—	—	—	15	—	—	Ω	
				7.5		$V_{in}=\pm 7.5V, V_{SS}=-7.5V$		—	—	—	10	—	—		—
Input/Output Leakage Current				5.0	$V_C=V_{SS}$	$V_{in}=+5.0V, V_{out}=-5.0V$		—	± 125	—	± 0.001	± 125	—	—	nA
						$V_{in}=-5.0V, V_{out}=+5.0V$		—	± 125	—	± 0.001	± 125	—	—	
						$V_{in}=+7.5V, V_{out}=-7.5V$		—	± 250	—	± 0.0015	± 250	—	—	
						$V_{in}=-7.5V, V_{out}=+7.5V$		—	± 250	—	± 0.0015	± 250	—	—	

■ SWITCHING CHARACTERISTICS

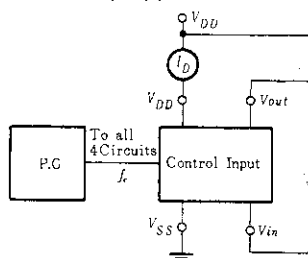
Characteristic		Symbol	Test Circuit	$V_{DD}(V)$	Test Conditions	min	typ	max	Unit	
Propagation Delay Time	Data Input	t_{PLH}	4	5.0	$V_C = V_{DD}, R_L = 10k\Omega, V_{SS} = 0V$	—	15	45	ns	
				10		—	7.0	15		
				15		—	6.0	12		
		t_{PHL}		5.0		—	15	45	ns	
				10		—	7.0	15		
				15		—	6.0	12		
	Control Input	t_{PLH}	5	5.0	$V_{in} \leq 10V, R_L = 1.0k\Omega, V_{SS} = 0V$	—	34	90	ns	
				10		—	20	45		
				15		—	15	35		
		t_{PHL}		5.0		—	34	90	ns	
				10		—	20	45		
				15		—	15	35		
	Crosstalk (Control to Output)			6	5.0	$V_C = V_{DD}, R_{in} = 1.0k\Omega, R_{out} = 10k\Omega, V_{SS} = 0V$	—	30	—	mV
			10	—	50		—			
			15	—	100		—			
Crosstalk (between any two switches)				5.0	$R_L = 1.0k\Omega, f = 1.0MHz, V_{SS} = 0V, \text{Crosstalk} = 20\log_{10} V_{out1} / V_{out2}$	—	-80	—	dB	
Maximum Control Input Pulse Frequency				5.0	$R_L = 1.0k\Omega, V_{SS} = 0V$	—	5.0	—	MHz	
		10	—	10		—				
		15	—	12		—				
Noise Voltage	V_n	7	5.0	$V_C = V_{DD}, f = 100Hz, V_{SS} = 0V$	—	24	—	nV/ $\sqrt{Hz}$		
			10		—	25	—			
			15		—	30	—			
			5.0	$V_C = V_{DD}, f = 100kHz, V_{SS} = 0V$	—	12	—			
			10		—	12	—			
			15		—	15	—			
Sine Wave (Distortion)				5.0	$V_{in} = 1.77V$ (rms Centered @0.0V), $R_L = 10k\Omega, f = 1.0kHz, V_{SS} = -5V$	—	0.16	—	%	
Insertion Loss			5.0	$V_C = V_{DD}, V_{in} = 1.77V, V_{SS} = -5V, \text{rms Centered @0.0V}, f = 1MHz, I.L. = 20\log_{10} \frac{V_{out}}{V_{in}}$	$R_L = 1.0k\Omega$	—	2.3	—	dB	
					$R_L = 10k\Omega$	—	0.2	—		
					$R_L = 100k\Omega$	—	0.1	—		
					$R_L = 1.0M\Omega$	—	0.05	—		
Bandwidth	BW	8	5.0	$V_C = V_{DD}, V_{in} = 1.77V, V_{SS} = -5V, \text{rms Centered @0.0V}, -3dB$	$R_L = 1.0k\Omega$	—	54	—	MHz	
					$R_L = 10k\Omega$	—	40	—		
					$R_L = 100k\Omega$	—	38	—		
					$R_L = 1.0M\Omega$	—	37	—		
Feedthrough			5.0	$V_C = V_{SS}, V_{SS} = -5V, 20\log_{10} \frac{V_{out}}{V_{in}} = -50dB$	$R_L = 1.0k\Omega$	—	1250	—	kHz	
					$R_L = 10k\Omega$	—	140	—		
					$R_L = 100k\Omega$	—	18	—		
					$R_L = 1.0M\Omega$	—	2.0	—		

DC CHARACTERISTIC TEST CIRCUIT

1. V_{IL} , V_{IH}

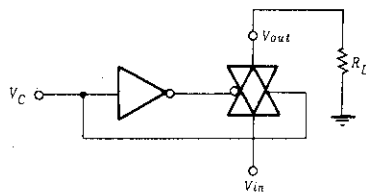


2. Quiescent Power Dissipation Test Circuit

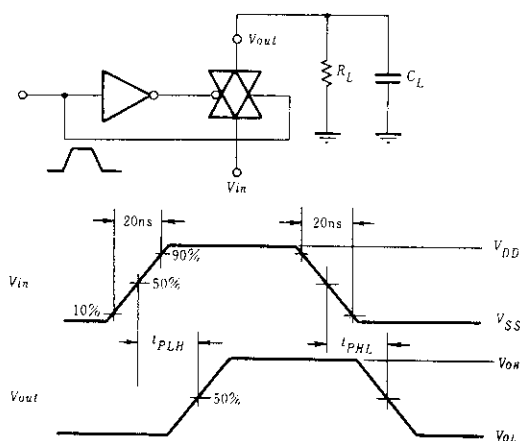


$$P_D = V_{DD} \times I_D$$

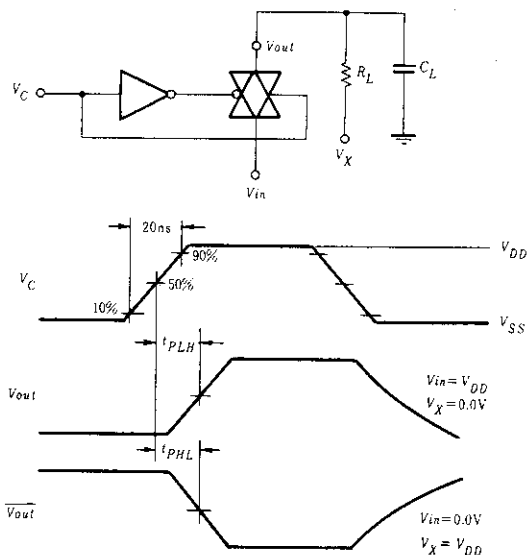
3. R_{ON}



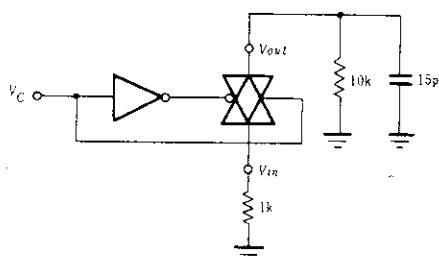
4. t_{PLH} , t_{PHL}



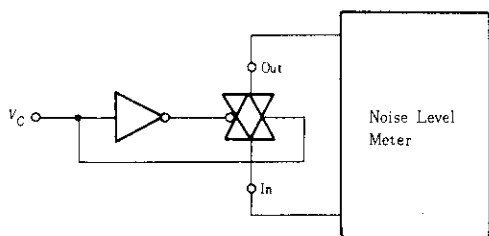
5. Turn-on Delay Time Test Circuit and Waveform



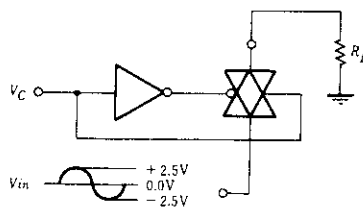
6. Crosstalk

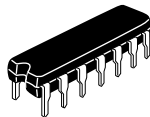
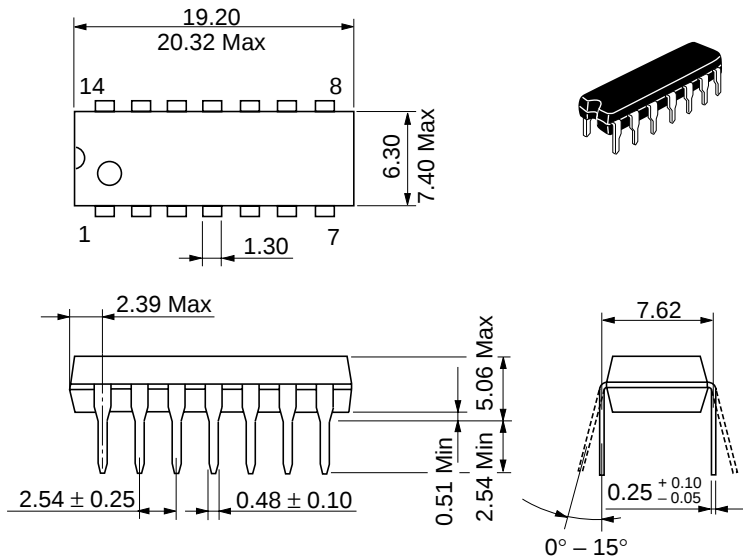


7. V_n



8. BW





Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.97 g

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL	NorthAmerica	: http://semiconductor.hitachi.com/
	Europe	: http://www.hitachi-eu.com/hel/ecg
	Asia (Singapore)	: http://www.has.hitachi.com.sg/grp3/sicd/index.htm
	Asia (Taiwan)	: http://www.hitachi.com.tw/E/Product/SICD_Frame.htm
	Asia (HongKong)	: http://www.hitachi.com.hk/eng/bo/grp3/index.htm
	Japan	: http://www.hitachi.co.jp/Sicd/indx.htm

For further information write to:

Hitachi Semiconductor (America) Inc. 179 East Tasman Drive, San Jose, CA 95134 Tel: <1> (408) 433-1990 Fax: <1> (408) 433-0223	Hitachi Europe GmbH Electronic components Group Dornacher Straße 3 D-85622 Feldkirchen, Munich Germany Tel: <49> (89) 9 9180-0 Fax: <49> (89) 9 29 30 00 Hitachi Europe Ltd. Electronic Components Group. Whitebrook Park Lower Cookham Road Maidenhead Berkshire SL6 8YA, United Kingdom Tel: <44> (1628) 585000 Fax: <44> (1628) 778322
--	---

Hitachi Asia Pte. Ltd. 16 Collyer Quay #20-00 Hitachi Tower Singapore 049318 Tel: 535-2100 Fax: 535-1533 Hitachi Asia Ltd. Taipei Branch Office 3F, Hung Kuo Building, No.167, Tun-Hwa North Road, Taipei (105) Tel: <886> (2) 2718-3666 Fax: <886> (2) 2718-8180
--

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX

Copyright ' Hitachi, Ltd., 1999. All rights reserved. Printed in Japan.