

HD14051B

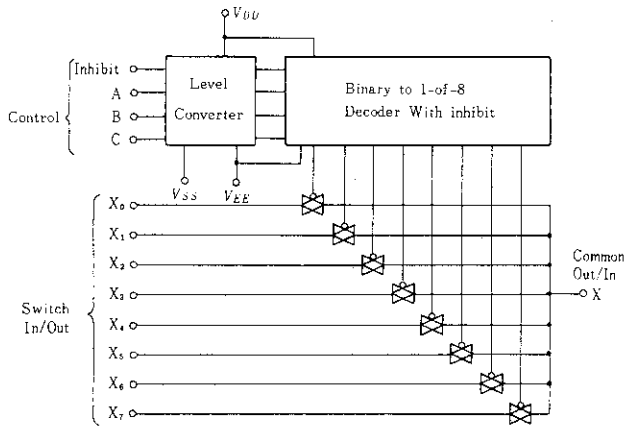
8-channel Analog Multiplexer/Demultiplexer

The HD14051B analog multiplexer is digitally controlled analog switch effectively implements an SP8T electronic switch and features low ON impedance and very low OFF leakage current. Control of analog signals up to the complete supply voltage range can be achieved.

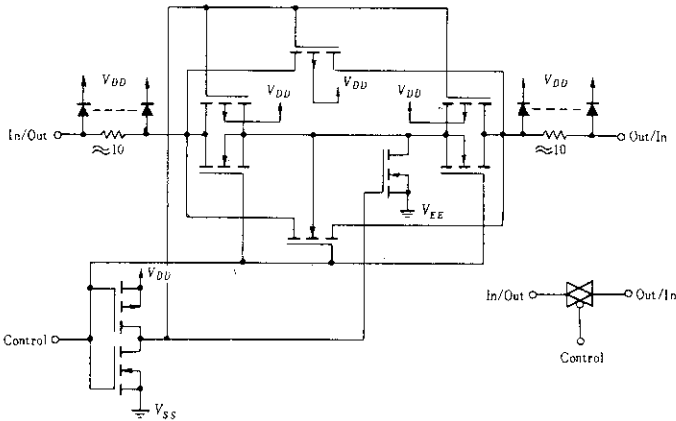
FEATURES

- High On/Off Output Voltage Ratio = 65dB typ.
- Quiescent Current = 5nA/pkg typ. @5V
- Low Crosstalk Between Switches = 80dB typ.
- Supply Voltage Range = 3 to 18V
- Linearized Transfer Characteristics, $\Delta R_{ON} < 60\Omega$ for $V_{in} = V_{DD}$ to V_{EE} @ 15V
- Pin-for-Pin Replacement for CD4051 and MC14051B

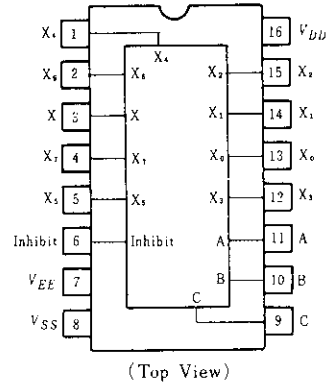
BLOCK DIAGRAM



SWITCH CIRCUIT SCHEMATIC



PIN ARRANGEMENT



TRUTH TABLE

Control Inputs				ON Switch
Inhibit	C	B	A	
0	0	0	0	X ₀
0	0	0	1	X ₁
0	0	1	0	X ₂
0	0	1	1	X ₃
0	1	0	0	X ₄
0	1	0	1	X ₅
0	1	1	0	X ₆
0	1	1	1	X ₇
1	x	x	x	—

x=Don't Care

■ MAXIMUM RATINGS (Voltages referenced to V_{SS})

Characteristic	Symbol	Value	Unit
DC Supply Voltage	$V_{DD}-V_{EE}$	-0.5~+18	V_{DC}
Control Input Voltage	V_{in}	$V_{SS}-0.5\sim V_{DD}+0.5$	V_{OC}
Signal Voltage	V_{sig}	$V_{EE}-0.5\sim V_{DD}+0.5$	V_{P-P}
Control Input Current	I_{in}	± 10	mA
Signal Current	I_{sig}	25	mA
Operating Temperature Range	T_A	-40~+85	°C
Storage Temperature Range	T_{stg}	-65~+150	°C
Power Dissipation	P_D	300	mW

■ ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	$V_{DD}(V)$	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
Input Voltage	V_{IL}	5.0	$R_L=10k\Omega$ $V_o=0.5V$	-	1.5	-	2.25	1.5	-	1.5	V
		10	SW入力 = V_{DD} $V_o=1.0V$	-	3.0	-	4.50	3.0	-	3.0	
		15	$V_{EE}=V_{SS}$ $V_o=1.5V$	-	4.0	-	6.75	4.0	-	4.0	
	V_{IH}	5.0	$R_L=10k\Omega$ $V_o=4.0V$	3.5	-	3.5	2.75	-	3.5	-	V
		10	SW入力 = V_{DD} $V_o=9.0V$	7.0	-	7.0	5.50	-	7.0	-	
		15	$V_{EE}=V_{SS}$ $V_o=13.5V$	11.0	-	11.0	8.25	-	11.0	-	
Input Current	I_{in}		Control, Inhibit	-	-	-	10	-	-	-	pA
Input Capacitance	Control, Inhibit	C_{in}	$V_{in}=0$	-	-	-	5.0	-	-	-	pF
	Switch Inputs			-	-	-	10	-	-	-	
Output Capacitance	C_{out}	10		-	-	-	60	-	-	-	pF
Feedthrough Capacitance	C_{in-out}	10		-	-	-	0.18	-	-	-	pF
Quiescent Current	I_{DD}	5.0	Zero Signal, per Package	-	20	-	0.005	20	-	150	μA
		10		-	40	-	0.010	40	-	300	
		15		-	80	-	0.015	80	-	600	
Total Supply Current	I_T	5.0	Dynamic + I_{DD} , per Gate $f=1kHz$	-	-	-	0.07	-	-	-	μA
		10		-	-	-	0.20	-	-	-	
		15		-	-	-	0.36	-	-	-	
ON Resistance	R_{ON}	5.0		-	880	-	250	1050	-	1200	Ω
		10		-	450	-	120	500	-	520	
		15		-	250	-	80	280	-	300	
ΔR_{ON} Between Any Two Channels	ΔR_{ON}	5.0	Two Channels	-	-	-	25	-	-	-	Ω
		10		-	-	-	10	-	-	-	
		15		-	-	-	5.0	-	-	-	
OFF Channel Leakage Current		15	Each Channel	-	1000	-	± 0.01	1000	-	3000	nA
			All Channels OFF	-	1000	-	± 0.08	1000	-	3000	

* To calculate total supply current at frequency other than 1kHz.

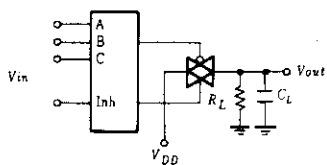
① $V_{DD}=5.0V$ $I_T=(0.07\mu A/kHz)f+I_{DD}$ ② $V_{DD}=10V$ $I_T=(0.20\mu A/kHz)f+I_{DD}$ ③ $V_{DD}=15V$ $I_T=(0.36\mu A/kHz)f+I_{DD}$

■ SWITCHING CHARACTERISTICS. ($C_L=50\text{pF}$, $T_a=25^\circ\text{C}$)

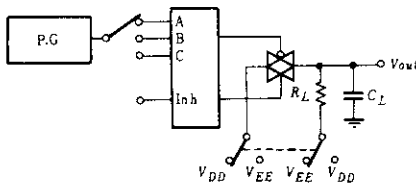
Characteristic	Symbol	Test Conditions		min	typ	max	Unit		
		$V_{DD}(\text{V})$							
Propagation Delay Time	Switch Input to Switch Output	t_{PLH}	5.0	$R_L = 10\text{k}\Omega$	—	35	90	ns	
			10		—	15	40		
			15		—	12	30		
			t_{PHL}		5.0	—	35	90	ns
					10	—	15	40	
					15	—	12	30	
	Control Input to Output	t_{PLH}	5.0		—	1400	2000	ns	
			10		—	450	700		
			15		—	260	500		
		t_{PHL}	5.0		—	1400	2500	ns	
			10		—	450	700		
			15		—	260	500		
Output Enable Time	t_{ZH}, t_{ZL}	5.0	$R_L = 10\text{k}\Omega$	—	850	2125	ns		
		10		—	300	750			
		15		—	250	625			
Output Disable Time	t_{HZ}, t_{LZ}	5.0		—	850	2125	ns		
		10		—	300	750			
		15		—	250	625			
Sine Wave(Distortion)		10		$R_L = 1\text{k}\Omega, f = 1\text{kHz}$	—	0.04	—	%	
Bandwidth	BW	10		$R_L = 1\text{k}\Omega, V_{iA} = \frac{1}{2}(V_{DD} - V_{SS})_{p-p}, 20\log_{10} V_{out}/V_{iA} = -3\text{dB}$	—	20	—	MHz	
Feedthrough		10		$R_L = 1\text{k}\Omega, 20\log_{10} V_{out}/V_{iA} = -50\text{dB}$	—	4.5	—	MHz	
Channel Separation		10		$R_L = 1\text{k}\Omega, V_{iA} = \frac{1}{2}(V_{DD} - V_{SS})_{p-p}, 20\log_{10} V_{out(A)}/V_{iA(A)} = -50\text{dB}$	—	3.0	—	MHz	
Feedthrough Control		10		$R_L = 1\text{k}\Omega, R_L = 10\text{k}\Omega, \text{Control, Inhibit } t_i = t_f = 20\text{ns}$	—	30	—	mV	
Maximum Control Frequency		10		$R_L = 1\text{k}\Omega, V_{out} = \frac{1}{2}V_{iA}$	—	10	—	MHz	

■ DC CHARACTERISTIC TEST CIRCUIT

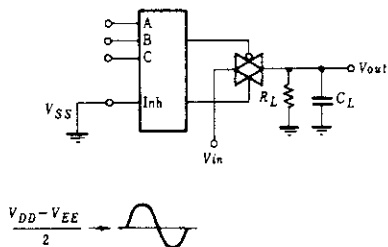
1. Input Voltage



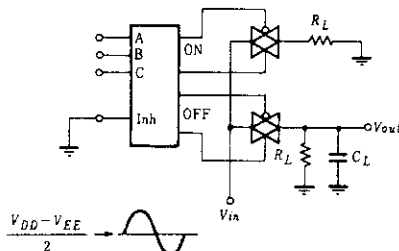
2. Propagation Delay Time



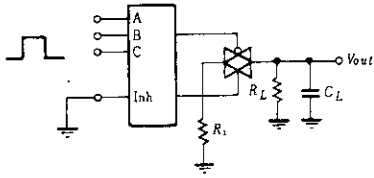
3. Bandwidth, Feedthrough



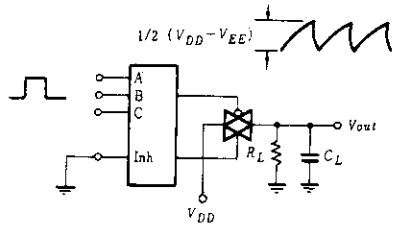
4. Crosstalk



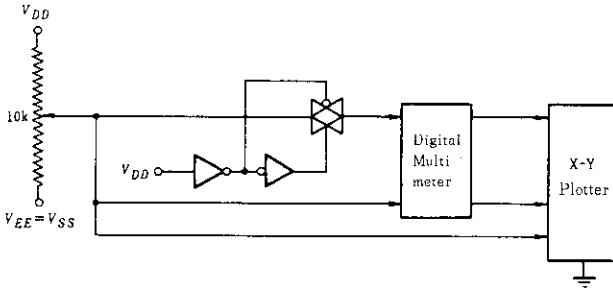
5. Feedthrough



6. Maximum Control Frequency

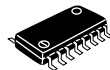


7. R_{ON}





Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 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 North America : <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.

HITACHI