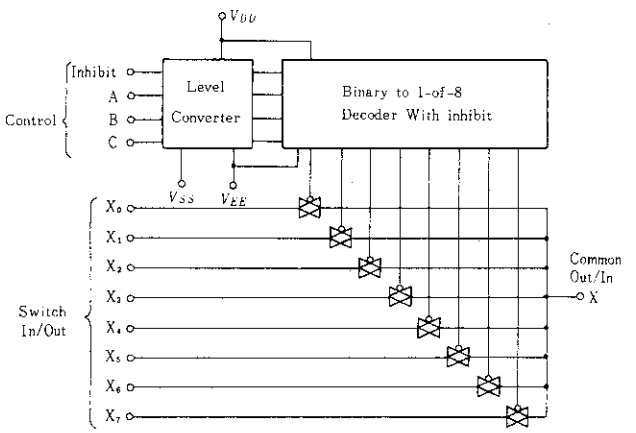
8-channel Analog Multiplexer/Demultiplexer

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.

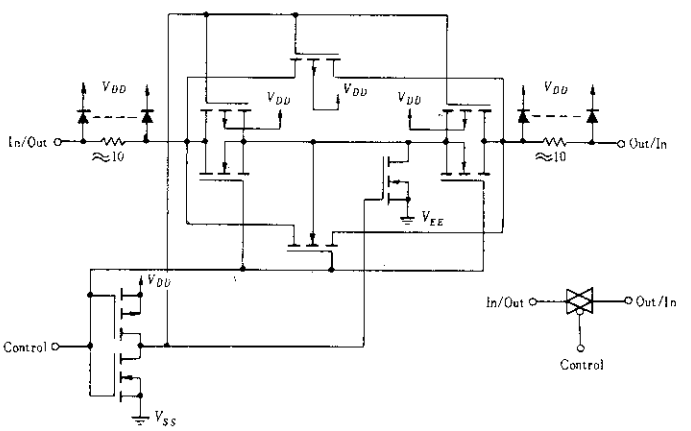
■ FEATURES

- 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, ΔR_{ON} < 60Ω for Vin = V_{DD} to V_{EE} @ 15V
- Pin-for-Pin Replacement for CD4051 and MC14051B

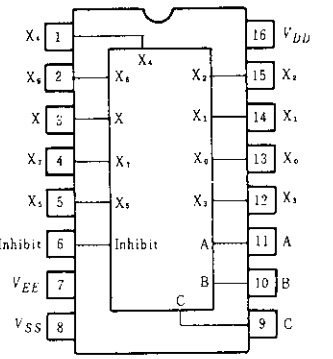
■ BLOCK DIAGRAM



■ SWITCH CIRCUIT SCHEMATIC



■ PIN ARRANGEMENT



(Top View)

■ 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 = 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}
Controol Input Voltage	V_{in}	$V_{SS}-0.5 \sim V_{DD}+0.5$	V_{DC}
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	℃
Storage Temperature Range	T_{stg}	−65～+150	℃
Power Dissipation*	P_D	300	mW

■ELECTRICAL CHARACTERISTICS

Characteristic		Symbol	V_{DD}(V)	Test Conditions		−40℃ min	−40℃ max	25℃ min	25℃ typ	25℃ max	85℃ min	85℃ max	Unit
Input Voltage		V_{IL}	5.0	R_L=10kΩ	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=10kΩ	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	
△ON Resistance Between Any Two Channels		$\triangle R_{ON}$	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	

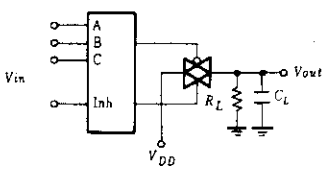
* To calculate total supply current at frequency other than 1kHz.
※ V_{DD}=5.0V I_T=(0.07μA/kHz)f+I_{DD} ※ V_{DD}=10V I_T=(0.20μA/kHz)f+I_{DD} ※ V_{DD}=15V I_T=(0.36μA/kHz)f+I_{DD}

■SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25℃)

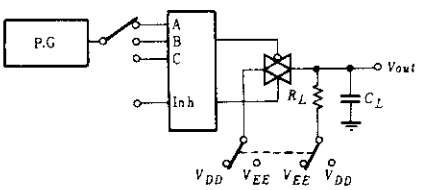
Characteristic		Symbol	V_{DD}(V)	Test Conditions	min	typ	max	Unit
Propagation Delay Time	Switch Input to Switch Output	t_{PLH}	5.0	R_L=10kΩ	–	35	90	ns
			10		–	15	40	
			15		–	12	30	
		t_{PHL}	5.0		–	35	90	
			10		–	15	40	
			15		–	12	30	
	Control Input to Output	t_{PLH}	5.0		–	1400	2000	
			10		–	450	700	
			15		–	260	500	
		t_{PHL}	5.0		–	1400	2500	
			10		–	450	700	
			15		–	260	500	
Output Enable Time		t_{ZH}, t_{ZL}	5.0	R_L=10kΩ	–	850	2125	ns
			10		–	300	750	
			15		–	250	625	
Output Disable Time		t_{HZ}, t_{LZ}	5.0		–	850	2125	
			10		–	300	750	
			15		–	250	625	
Sine Wave(Distortion)			10	R_L=1kΩ, f=1kHz	–	0.04	–	%
Bandwidth		BW	10	R_L=1kΩ, V_{in}=½(V_{DD}−V_{SS})$_{p-p}$, 20log$_{10}$ V_{out}/V_{in}=−3dB	–	20	–	MHz
Feedthrough			10	R_L=1kΩ, 20log$_{10}$ V_{out}/V_{in}=−50dB	–	4.5	–	MHz
Channel Separation			10	R_L=1kΩ, V_{in}=½(V_{DD}−V_{SS})$_{p-p}$, 20log$_{10}$ $V_{out(B)}$/$V_{in(A)}$=−50dB	–	3.0	–	MHz
Feedthrough Control			10	R_1=1kΩ, R_L=10kΩ, Control, Inhibit t_r=t_f=20ns	–	30	–	mV
Maximum Control Frequency			10	R_L=1kΩ, V_{out}=½ V_{in}	–	10	–	MHz

■DC CHARACTERISTIC TEST CIRCUIT

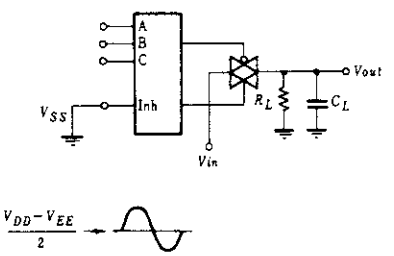
1. Input Voltage



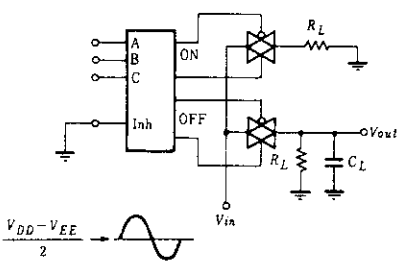
2. Propagation Delay Time



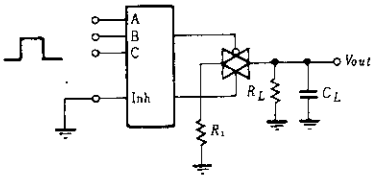
3. Bandwidth, Feedthrough



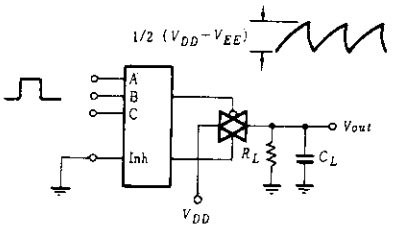
4. Crosstalk



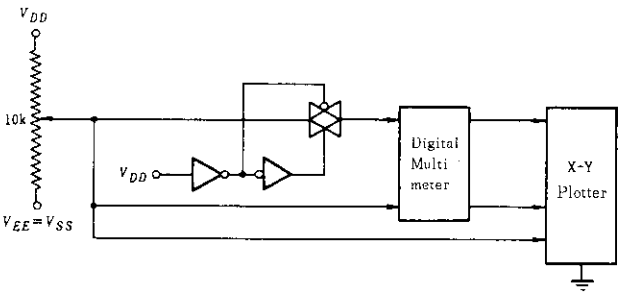
5. Feedthrough



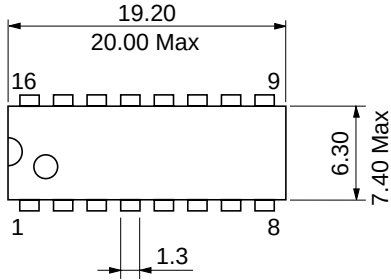
6. Maximum Control Frequency

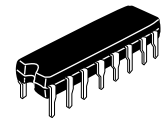


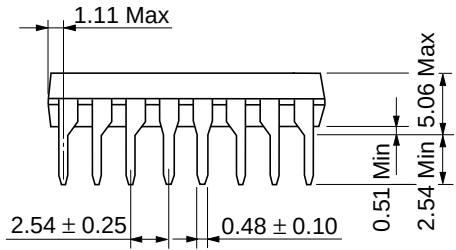
7. R_{ON}

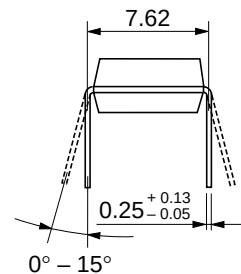


Unit: mm



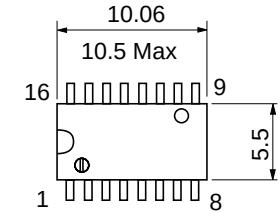


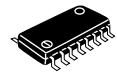


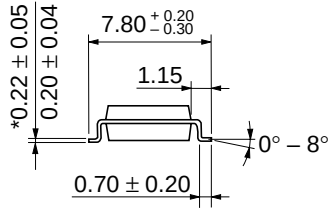


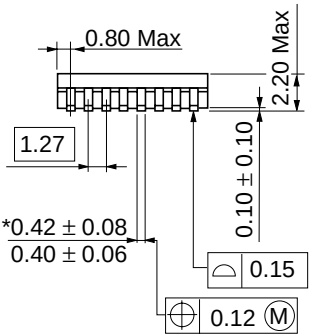
Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm





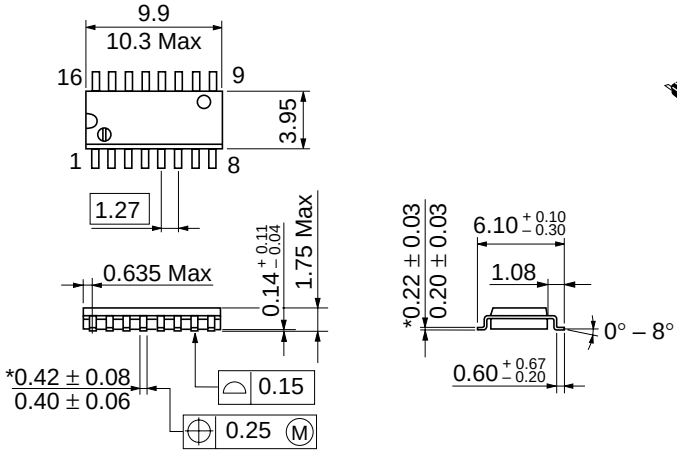




*Dimension including the plating thickness
Base material dimension

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

Unit: mm



Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

*Dimension including the plating thickness
Base material dimension

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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

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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