

# HD14051B

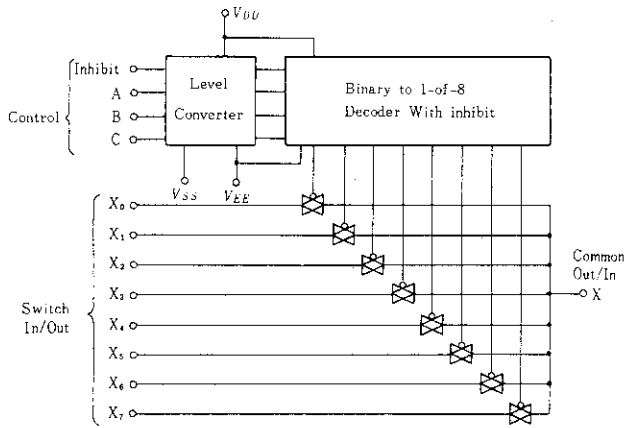
## 8-channel Analog Multiplexer/Demultiplexer

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.

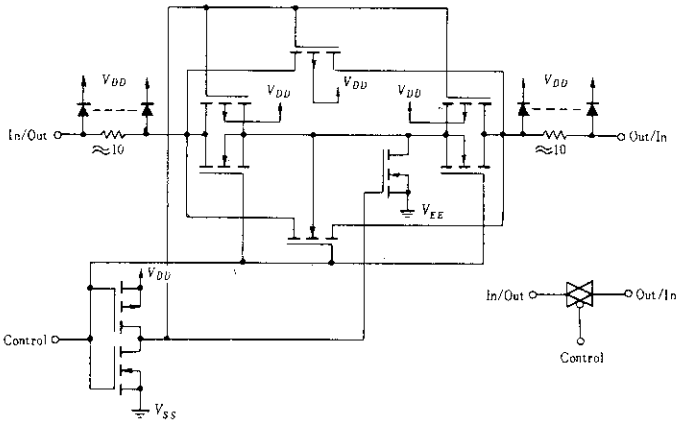
### FEATURES

- 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

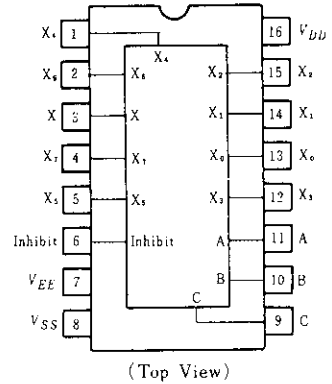
### BLOCK DIAGRAM



### SWITCH CIRCUIT SCHEMATIC



### PIN ARRANGEMENT



### TRUTH TABLE

Control Inputs				ON Switch
Inhibit	C	B	A	
0	0	0	0	X <sub>0</sub>
0	0	0	1	X <sub>1</sub>
0	0	1	0	X <sub>2</sub>
0	0	1	1	X <sub>3</sub>
0	1	0	0	X <sub>4</sub>
0	1	0	1	X <sub>5</sub>
0	1	1	0	X <sub>6</sub>
0	1	1	1	X <sub>7</sub>
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	$I_{in}$	$\pm 10$	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	$\mu A$	
		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	-	-	-	$\mu A$	
		10		-	-	-	0.20	-	-	-		
		15		-	-	-	0.36	-	-	-		
ON Resistance	$R_{ON}$	5.0		-	880	-	250	1050	-	1200	$\Omega$	
		10		-	450	-	120	500	-	520		
		15		-	250	-	80	280	-	300		
$\Delta ON$ Resistance Between Any Two Channels	$\Delta R_{ON}$	5.0	Two Channels	-	-	-	25	-	-	-	$\Omega$	
		10		-	-	-	10	-	-	-		
		15		-	-	-	5.0	-	-	-		
OFF Channel Leakage Current		15	Each Channel	-	1000	-	$\pm 0.01$	1000	-	3000	nA	
			All Channels OFF	-	1000	-	$\pm 0.08$	1000	-	3000		

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

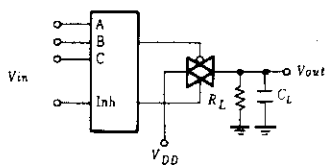
①  $V_{DD}=5.0V$   $I_T=(0.07\mu A/kHz)f+I_{DD}$     ②  $V_{DD}=10V$   $I_T=(0.20\mu A/kHz)f+I_{DD}$     ③  $V_{DD}=15V$   $I_T=(0.36\mu A/kHz)f+I_{DD}$

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

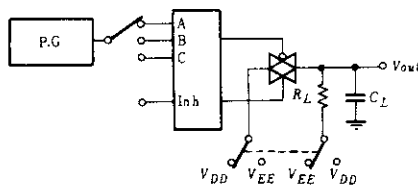
Characteristic		Symbol	$V_{DD}(\text{V})$	Test Conditions	min	typ	max	Unit
Propagation Delay Time	Switch Input to Switch Output	$t_{PLH}$	5.0	$R_L = 10\text{k}\Omega$	—	35	90	ns
			10		—	15	40	
			15		—	12	30	
		$t_{PHL}$	5.0		—	35	90	ns
			10		—	15	40	
			15		—	12	30	
	Control Input to Output	$t_{PLH}$	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		$t_{ZH}$	5.0	$R_L = 10\text{k}\Omega$	—	850	2125	ns
		$t_{ZL}$	10		—	300	750	
			15		—	250	625	
Output Disable Time		$t_{HZ}$	5.0		—	850	2125	ns
		$t_{LZ}$	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	$R_L = 1\text{k}\Omega$ , $V_{iA} = \frac{1}{2}(V_{DD} - V_{SS})_{p-p}$ , $20 \log_{10} V_{out(A)}/V_{iA(B)} = -50\text{dB}$	—	3.0	—	MHz
Feedthrough Control			10	$R_L = 1\text{k}\Omega$ , $R_L = 10\text{k}\Omega$ , 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

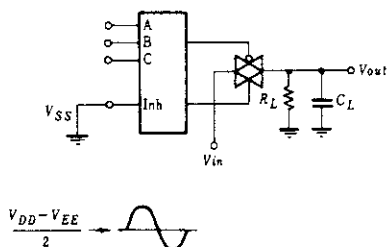
1. Input Voltage



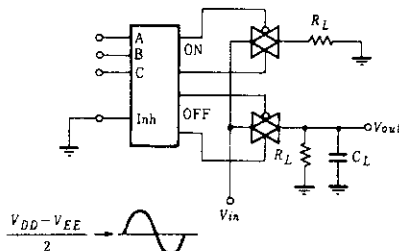
2. Propagation Delay Time



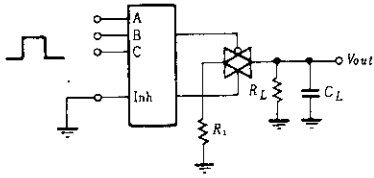
3. Bandwidth, Feedthrough



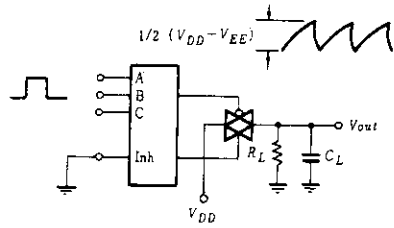
4. Crosstalk



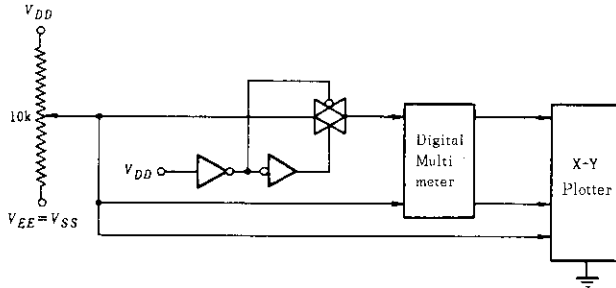
5. Feedthrough

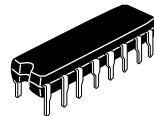
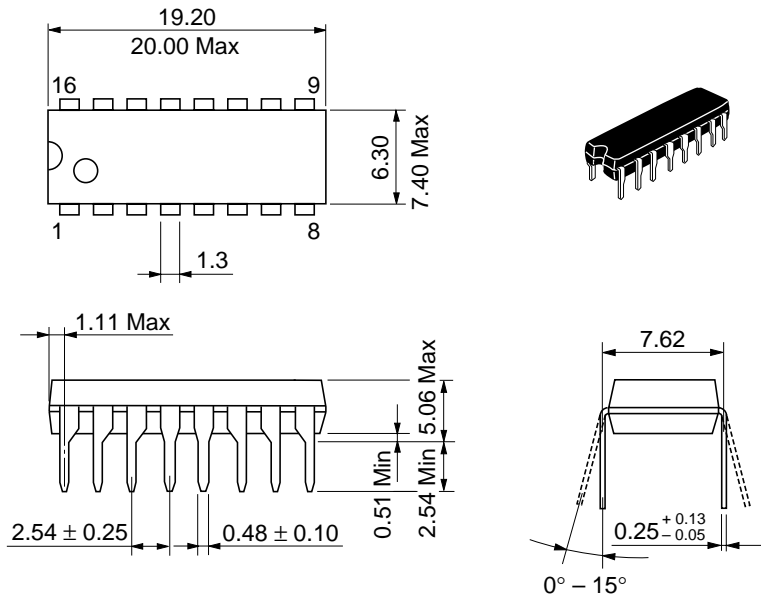


6. Maximum Control Frequency

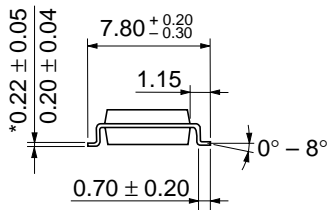
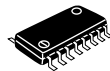
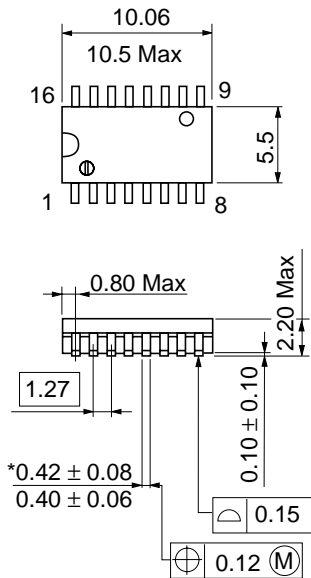


7.  $R_{ON}$



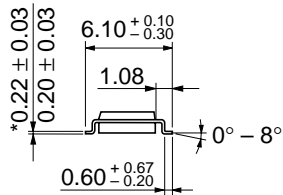
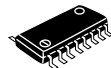
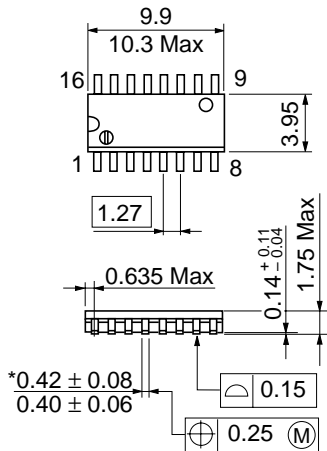


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



\*Dimension including the plating thickness  
Base material dimension

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



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

\*Dimension including the plating thickness  
Base material dimension

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