

HD14051B

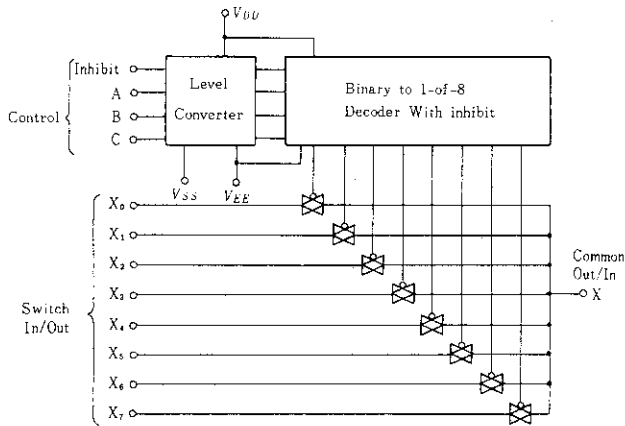
8-channel Analog Multiplexer/Demultiplexer

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.

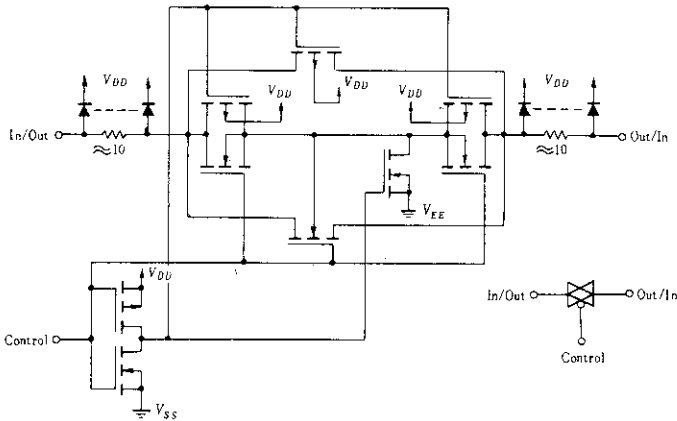
FEATURES

- 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

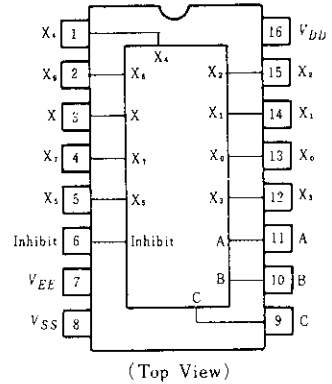
BLOCK DIAGRAM



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	$V_{DD}-V_{EE}$	$-0.5 \sim +18$	V_{DC}
Control 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	$-40 \sim +85$	$^{\circ}C$
Storage Temperature Range	T_{stg}	$-65 \sim +150$	$^{\circ}C$
Power Dissipation	P_D	300	mW

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD} (V)	Test Conditions	$-40^{\circ}C$		$25^{\circ}C$			$85^{\circ}C$		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	
Δ ON Resistance 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.

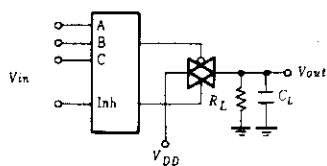
④ $V_{DD}=5.0V$ $I_T=(0.07\mu A/kHz)f+I_{DD}$ ⑤ $V_{DD}=10V$ $I_T=(0.20\mu A/kHz)f+I_{DD}$ ⑥ $V_{DD}=15V$ $I_T=(0.36\mu A/kHz)f+I_{DD}$

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

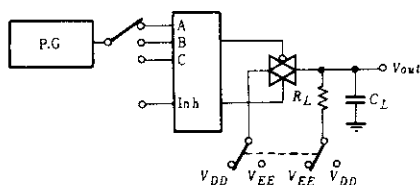
Characteristic		Symbol	$V_{DD}(\text{V})$	Test Conditions	min	typ	max	Unit
Propagation Delay Time	Switch Input to Switch Output	t_{PLH}	5.0	$R_L = 10\text{k}\Omega$	—	35	90	ns
			10		—	15	40	
			15		—	12	30	
		t_{PHL}	5.0		—	35	90	ns
			10		—	15	40	
			15		—	12	30	
	Control Input to Output	t_{PLH}	5.0		—	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}, 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	$R_L = 1\text{k}\Omega, V_{in} = \frac{1}{2}(V_{DD}-V_{SS})_{p-p}, 20\log_{10} V_{out}/V_{in} = -3\text{dB}$	—	20	—	MHz
Feedthrough			10	$R_L = 1\text{k}\Omega, 20\log_{10} V_{out}/V_{in} = -50\text{dB}$	—	4.5	—	MHz
Channel Separation			10	$R_L = 1\text{k}\Omega, V_{in} = \frac{1}{2}(V_{DD}-V_{SS})_{p-p}, 20\log_{10} V_{out(B)}/V_{out(A)} = -50\text{dB}$	—	3.0	—	MHz
Feedthrough Control			10	$R_L = 1\text{k}\Omega, R_L = 10\text{k}\Omega$, Control, Inhibit $t_r = t_f = 20\text{ns}$	—	30	—	mV
Maximum Control Frequency			10	$R_L = 1\text{k}\Omega, V_{in} = \frac{1}{2} V_{in}$	—	10	—	MHz

DC CHARACTERISTIC TEST CIRCUIT

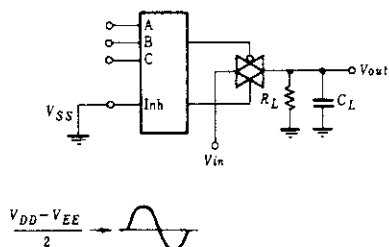
1. Input Voltage



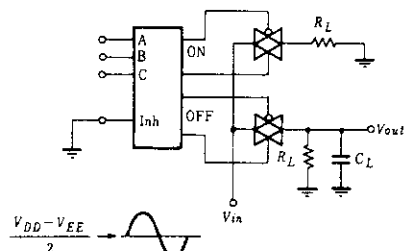
2. Propagation Delay Time



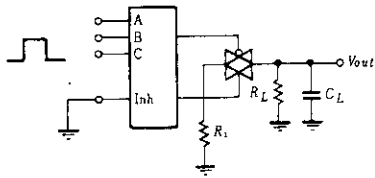
3. Bandwidth, Feedthrough



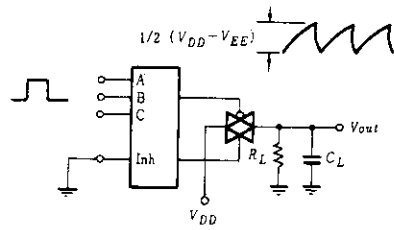
4. Crosstalk



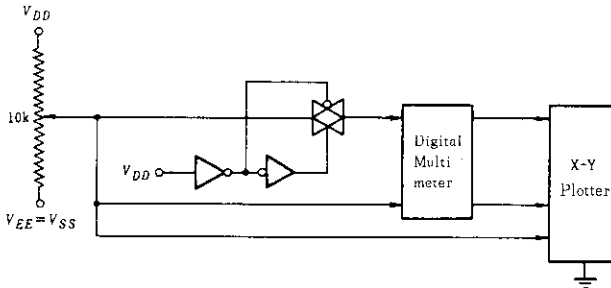
5. Feedthrough

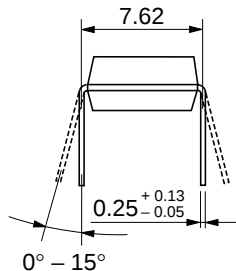
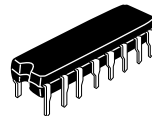
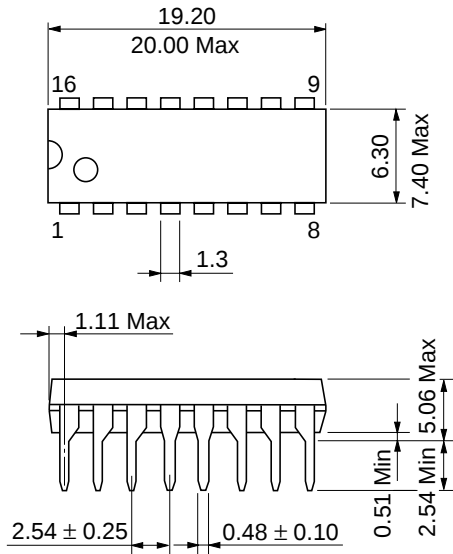


6. Maximum Control Frequency

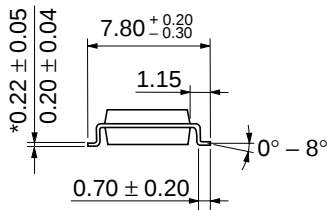
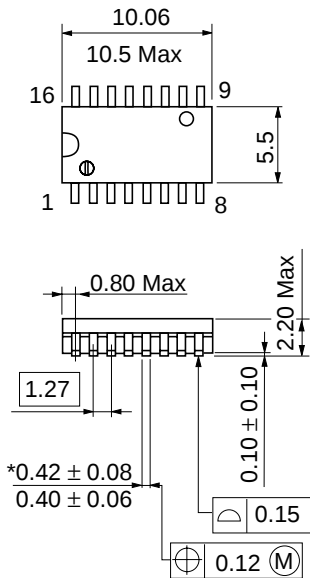


7. R_{ON}



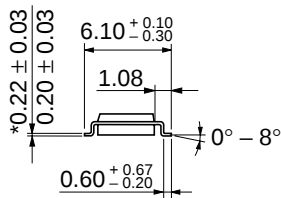
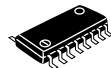
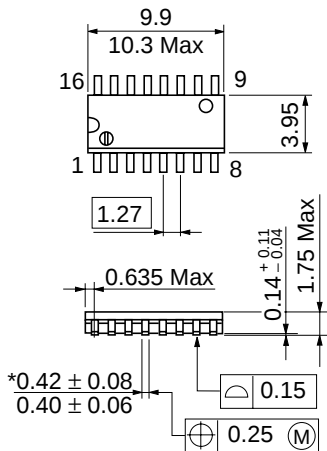


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



*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

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