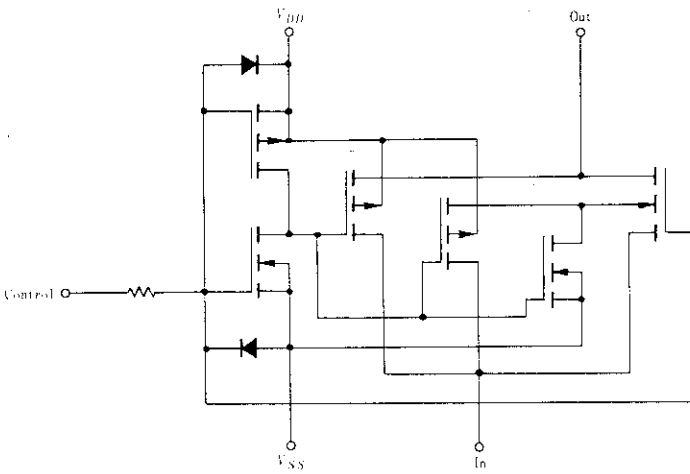


HD14016B

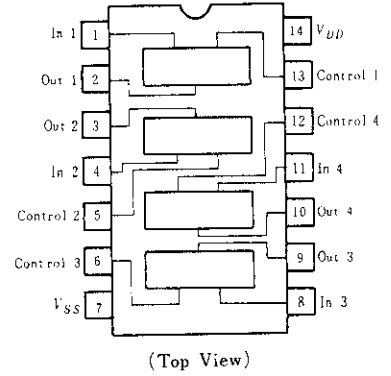
Quadruple Analog Switch/ Quadruple Multiplexer

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

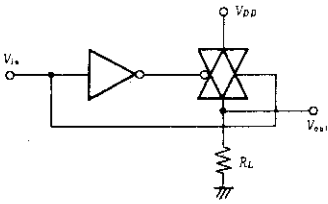
Characteristic	Symbol	Test Circuit	V _{DD} (V)	Test Conditions		-40°C		25°C			85°C		Unit		
						min	max	min	typ	max	min	max			
Input Voltage	V _{IL}	1	5.0	R _L = 10kΩ SW Input = V _{DD}	V _O = 1.0V	—	0.9	—	1.5	0.9	—	0.9	V		
			10			—	0.9	—	1.5	0.9	—	0.9			
			15			—	0.9	—	1.5	0.9	—	0.9			
	V _{IH}		5.0	R _L = 10kΩ SW Input = V _{DD}	V _O = 4.0V	3.5	—	3.5	2.75	—	3.5	—	V		
			10			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 _{IK}	15			—	±0.3		—	±0.00001	±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 = 10kΩ	V _{SS} = -5V	V _{in} = -5.0V	—	610	—	300	660	—	840	Ω	
						V _{in} = -5.0V	—	610	—	300	660	—	840		
						V _{in} = ±0.25V	—	610	—	280	660	—	840		
						V _{SS} = -7.5V	V _{in} = -7.5V	—	370	—	240	400	—		520
							V _{in} = -7.5V	—	370	—	240	400	—		520
							V _{in} = ±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			
					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} = ±5.0V, V _{SS} = -5V	—	—	—	15	—	—	—	Ω		
		7.5			V _{in} = ±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

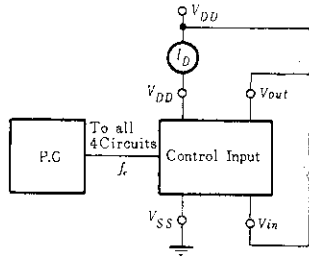
Characteristic		Symbol	Test Circuit	$V_{DD}(V)$	Test Conditions	min	typ	max	Unit	
Propagation Delay Time	Data Input	t_{PLH}	4	5.0	$V_C = V_{DD}, R_L = 10k\Omega, V_{SS} = 0V$	-	15	45	ns	
				10		-	7.0	15		
				15		-	6.0	12		
		t_{PHL}		5.0		-	15	45	ns	
				10		-	7.0	15		
				15		-	6.0	12		
	Control Input	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}

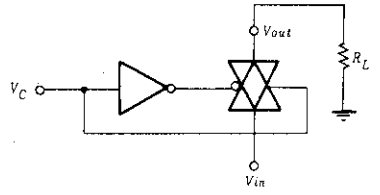


2. Quiescent Power Dissipation Test Circuit

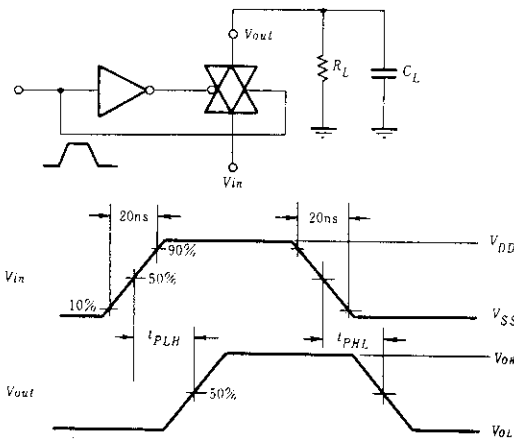


$$P_D = V_{DD} \times I_D$$

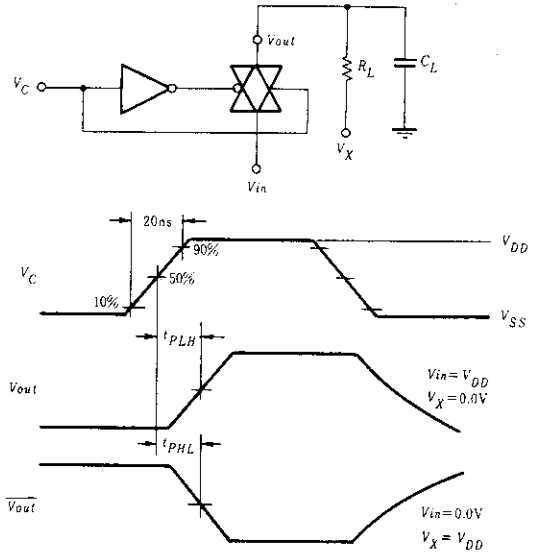
3. R_{ON}



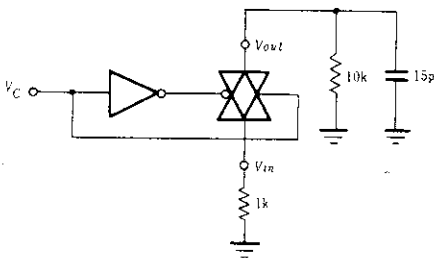
4. t_{PLH} , t_{PHL}



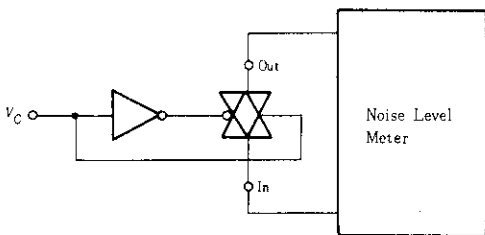
5. Turn-on Delay Time Test Circuit and Waveform



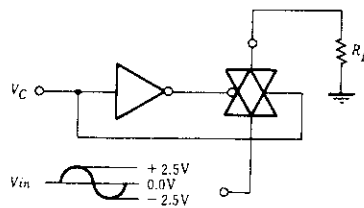
6. Crosstalk

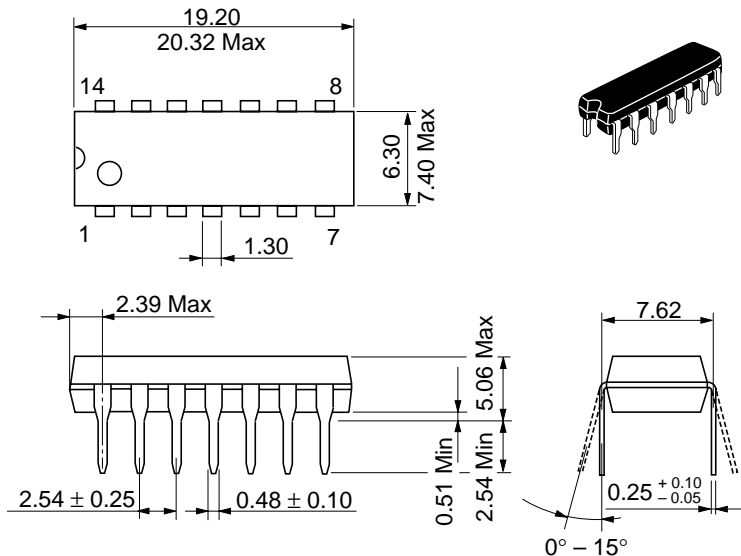


7. V_n



8. BW





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

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