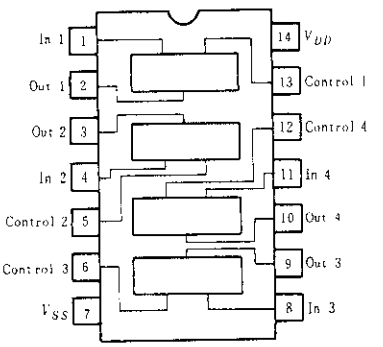
HD14016B

Quadruple Analog Switch/ Quadruple Multiplexer

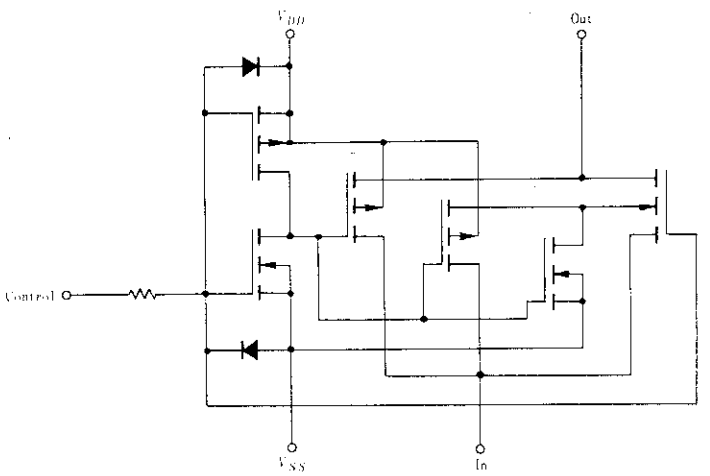
The HD14016B quad bilateral switch consists of four independent switches capable of controlling either digital or analog signals. The quad bilateral switch is used in signal gating, chopper, modulator, demodulator and CMOS logic implementation.

■ PIN ARRANGEMENT



(Top View)

■ CIRCUIT SCHEMATIC (1/4)



■ELECTRICAL CHARACTERISTICS

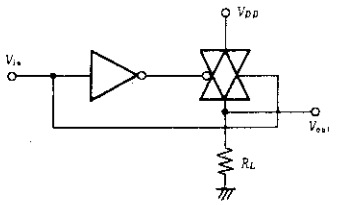
Characteristic		Symbol	Test Circuit	V_{DD}(V)	Test Conditions		−40°C min	−40°C max	25°C min	25°C typ	25°C max	85°C min	85°C max	Unit
Input Voltage		V_{IL}	1	5.0	R_L=10kΩ SW Input =V_{DD}	V_O=1.0V	—	0.9	—	1.5	0.9	—	0.9	V
				10		V_O=1.0V	—	0.9	—	1.5	0.9	—	0.9	
				15		V_O=1.0V	—	0.9	—	1.5	0.9	—	0.9	
		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_{in}		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	
				7.5		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	
				15		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	—	—	
				7.5		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

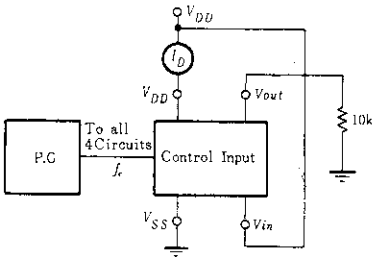
Characteristic		Symbol	Test Circuit	V_{DD}(V)	Test Conditions		min	typ	max	Unit
Propagation Delay Time	Data Input	t_{PLH}	4	5.0	$V_C = V_{DD}$, $R_L = 10k\Omega$, $V_{SS} = 0$ V		–	15	45	ns
				10			–	7.0	15	
				15			–	6.0	12	
		t_{PHL}		5.0			–	15	45	ns
				10			–	7.0	15	
				15			–	6.0	12	
	Control Input	t_{PLH}	5	5.0	$V_{in} \leqq 10$ V, $R_L = 1.0k\Omega$, $V_{SS} = 0$ V		–	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	$V_C = V_{DD}$, $R_{in} = 1.0k\Omega$, $R_{out} = 10k\Omega$, $V_{SS} = 0$ V		–	30	–	mV
				10			–	50	–	
				15			–	100	–	
Crosstalk (between any two switches)				5.0	$R_L = 1.0k\Omega$, $f = 1.0$MHz, $V_{SS} = 0$ V, Crosstalk $= 20\log 10\ V_{out\,1} / V_{out\,2}$		–	–80	–	dB
							–		–	
Maximum Control Input Pulse Frequency				5.0	$R_L = 1.0k\Omega$, $V_{SS} = 0$ V		–	5.0	–	MHz
				10			–	10	–	
				15			–	12	–	
Noise Voltage		V_n	7	5.0	$V_C = V_{DD}$, $f = 100$Hz, $V_{SS} = 0$ V		–	24	–	nV/√Hz
				10			–	25	–	
				15			–	30	–	
				5.0	$V_C = V_{DD}$, $f = 100$kHz, $V_{SS} = 0$ V		–	12	–	
				10			–	12	–	
				15			–	15	–	
Sine Wave (Distortion)				5.0	$V_{in} = 1.77$ V (rms Centered @0.0V), $R_L = 10k\Omega$, $f = 1.0$kHz, $V_{SS} = -5$ V		–	0.16	–	%
							–		–	
Insertion Loss				5.0	$V_C = V_{DD}$, $V_{in} = 1.77$V, $V_{SS} = -5$ V, rms Centered @0.0V, $f = 1$MHz, $I.L = 20\log 10 \frac{V_{out}}{V_{in}}$	$R_L = 1.0k\Omega$	–	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	$V_C = V_{DD}$, $V_{in} = 1.77$V, $V_{SS} = -5$V, rms Centered @0.0V, -3 dB	$R_L = 1.0k\Omega$	–	54	–	MHz
						$R_L = 10k\Omega$	–	40	–	
						$R_L = 100k\Omega$	–	38	–	
						$R_L = 1.0M\Omega$	–	37	–	
Feedthrough				5.0	$V_C = V_{SS}$, $V_{SS} = -5$ V, $20\log 10 \frac{V_{out}}{V_{in}} = -50$dB	$R_L = 1.0k\Omega$	–	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}

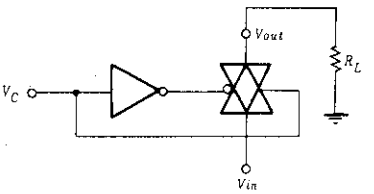


2. Quiescent Power Dissipation Test Circuit

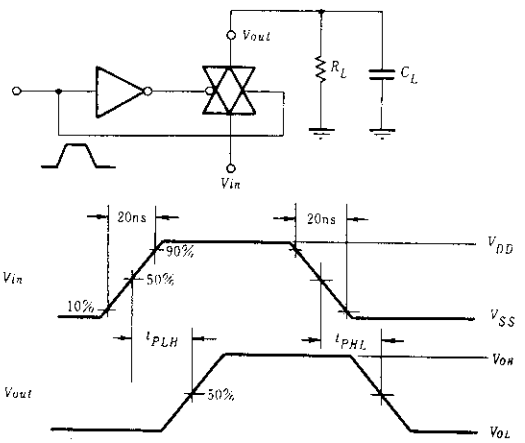


$$P_D = V_{DD} \times I_D$$

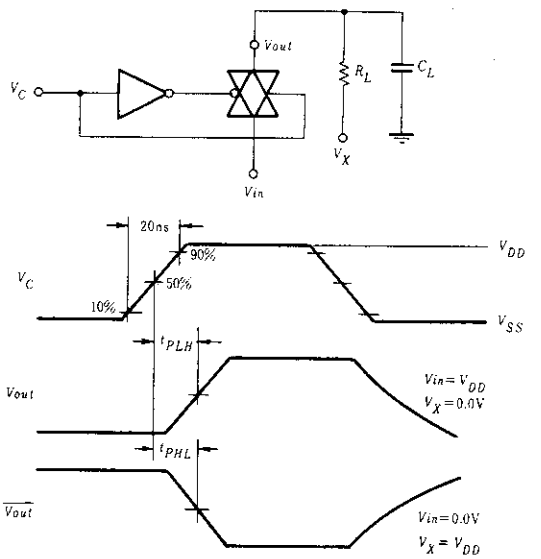
3. R_{ON}



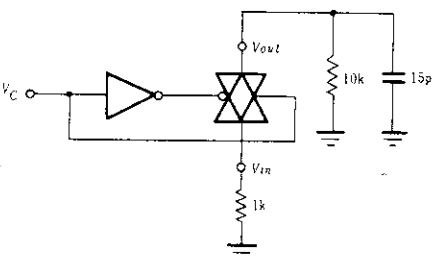
4. t_{PLH}, t_{PHL}



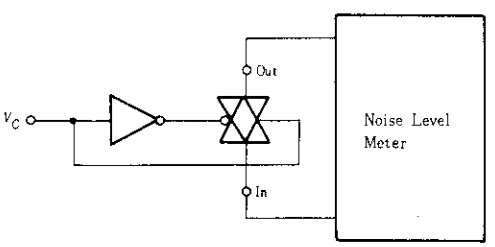
5. Turn-on Delay Time Test Circuit and Waveform



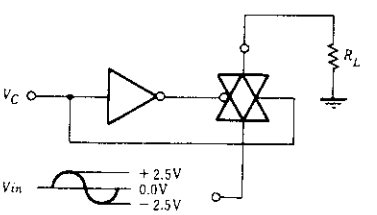
6. Crosstalk



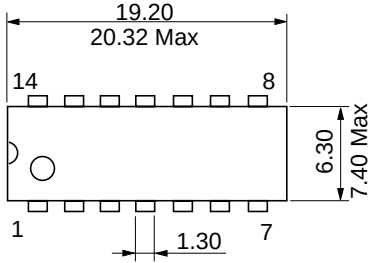
7. V_n

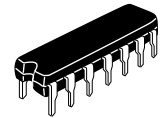


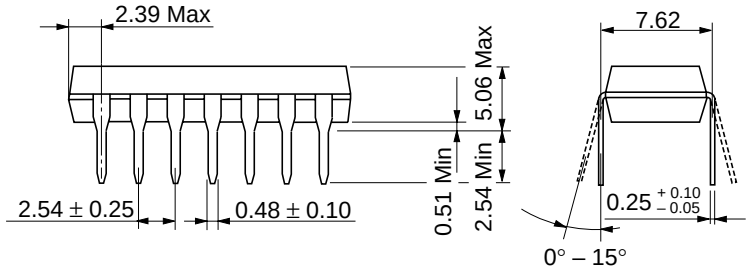
8. BW



Unit: mm







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