

# HD14007UB

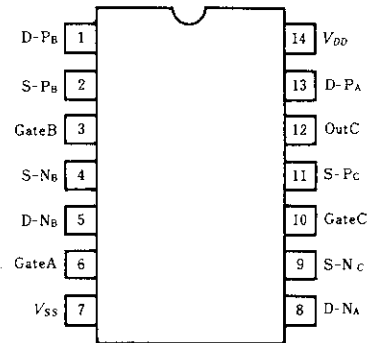
## Dual Complementary Pair plus Inverter

The HD14007UB multi-purpose device consists of three N-channel and three P-channel enhancement mode devices packaged to provide access to each device. These versatile parts are useful in inverter circuits, pulse-shapers, linear amplifiers, high input impedance amplifiers, threshold detectors, transmission gating, and functional gating.

### FEATURES

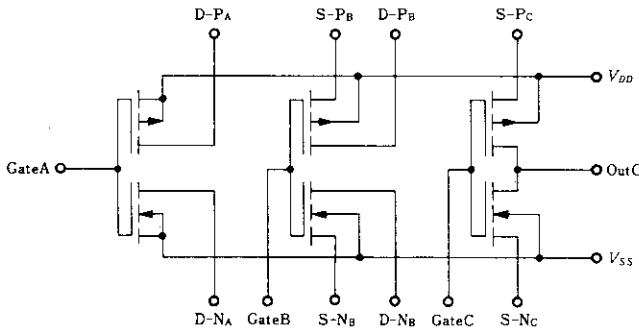
- Quiescent Current = 0.5nA/pkg typ @5V
- Supply Voltage Range = 3 to 18V
- Pin-for-Pin Replacement for CD4 007UB and MC14007UB

### PIN ARRANGEMENT



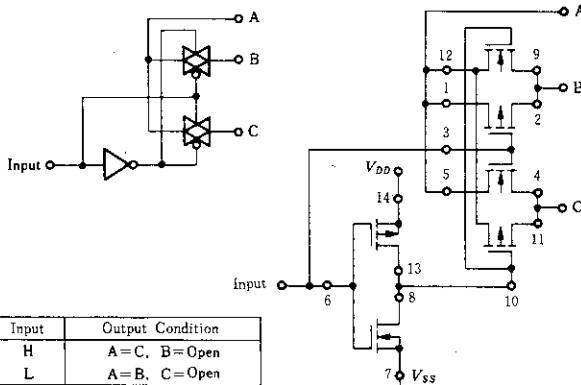
(Top View)

### CIRCUIT SCHEMATIC



### TYPICAL APPLICATION

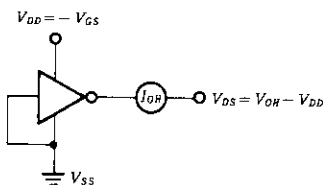
(2-input Analog Multiplexer)



Substrates of P-channel devices internally connected to  $V_{DD}$ .  
Substrates of N-channel devices internally connected to  $V_{SS}$ .

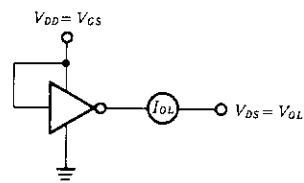
### DC CHARACTERISTIC TEST CIRCUIT

•  $I_{OH}$



All unused inputs connected to ground.

•  $I_{OL}$



All unused inputs connected to ground.

■ ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V <sub>DD</sub> (V)	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
Output Voltage	V <sub>OL</sub>	5.0	V <sub>in</sub> = V <sub>DD</sub> or 0	—	0.05	—	0	0.05	—	0.05	V
		10		—	0.05	—	0	0.05	—	0.05	
		15		—	0.05	—	0	0.05	—	0.05	
	V <sub>OH</sub>	5.0	V <sub>in</sub> = 0 or V <sub>DD</sub>	4.95	—	4.95	5.0	—	4.95	—	V
		10		9.95	—	9.95	10	—	9.95	—	
		15		14.95	—	14.95	15	—	14.95	—	
Input Voltage	V <sub>IL</sub>	5.0	V <sub>out</sub> = 4.5 or 0.5V	—	1.0	—	2.25	1.0	—	1.0	V
		10	V <sub>out</sub> = 9.0 or 1.0V	—	2.0	—	4.50	2.0	—	2.0	
		15	V <sub>out</sub> = 13.5 or 1.5V	—	2.5	—	6.75	2.5	—	2.5	
	V <sub>IH</sub>	5.0	V <sub>out</sub> = 0.5 or 4.5V	4.0	—	4.0	2.75	—	4.0	—	V
		10	V <sub>out</sub> = 1.0 or 9.0V	8.0	—	8.0	5.50	—	8.0	—	
		15	V <sub>out</sub> = 1.5 or 13.5V	12.5	—	12.5	8.25	—	12.5	—	
Output Drive Current	I <sub>OH</sub>	5.0	V <sub>OH</sub> = 2.5V	-1.3	—	-1.1	-5.0	—	-0.9	—	mA
		10	V <sub>OH</sub> = 9.5V	-0.65	—	-0.55	-2.5	—	-0.45	—	
		15	V <sub>OH</sub> = 13.5V	-2.4	—	-2.0	-10	—	-1.6	—	
	I <sub>OL</sub>	5.0	V <sub>OL</sub> = 0.4V	0.52	—	0.44	1.0	—	0.36	—	mA
		10	V <sub>OL</sub> = 0.5V	1.3	—	1.1	2.5	—	0.9	—	
		15	V <sub>OL</sub> = 1.5V	4.0	—	3.3	10	—	2.7	—	
Input Current	I <sub>in</sub>	15		—	±0.3	—	±0.0001	±0.3	—	±1.0	μA
Input Capacitance	C <sub>in</sub>		V <sub>in</sub> = 0	—	—	—	5.0	7.5	—	—	pF
Quiescent Current	I <sub>DD</sub>	5.0	Zero Signal, per Package	—	0.5	—	0.0005	0.5	—	3.8	μA
		10		—	1.0	—	0.0010	1.0	—	7.5	
		15		—	2.0	—	0.0015	2.0	—	15	
Total Supply Current*	I <sub>T</sub>	5.0	Dynamic + I <sub>DD</sub> ,	—	—	—	0.72	—	—	—	μA
		10	per Gate,	—	—	—	1.44	—	—	—	
		15	C <sub>L</sub> = 50pF, f = 1kHz	—	—	—	2.16	—	—	—	

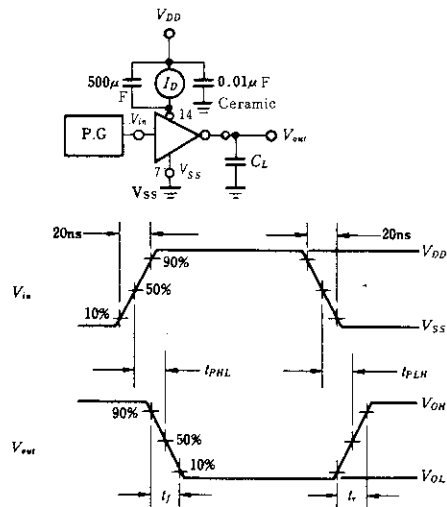
\* To calculate total supply current at frequency other than 1kHz.

\* V<sub>DD</sub> = 5.0V I<sub>T</sub> = (0.72μA/kHz)f + I<sub>DD</sub>, @V<sub>DD</sub> = 10V I<sub>T</sub> = (1.44μA/kHz)f + I<sub>DD</sub>, @V<sub>DD</sub> = 15V I<sub>T</sub> = (2.16μA/kHz)f + I<sub>DD</sub>

■ SWITCHING CHARACTERISTICS (C<sub>L</sub> = 50pF, T<sub>a</sub> = 25°C)

Characteristic	Symbol	V <sub>DD</sub> (V)	typ	max	Unit
Output Rise Time	t <sub>r</sub>	5.0	90	180	ns
		10	45	90	
		15	35	70	
Output Fall Time	t <sub>f</sub>	5.0	75	150	ns
		10	40	80	
		15	30	60	
Propagation Delay Time	t <sub>PLH</sub>	5.0	60	130	ns
		10	30	75	
		15	25	55	
	t <sub>PHL</sub>	5.0	60	130	ns
		10	30	75	
		15	25	55	

■ SWITCHING TIME TEST CIRCUIT



■ DC CHARACTERISTICS ( $V_{CC}=5V \pm 10\%$ ,  $T_a=-40$  to  $+85^\circ C$ )

Item	Symbol	Test Condition	min	typ	max	Unit	
Input Voltage	$V_{IH}$	$V_{out}=0.1V$ or $V_{CC}-0.1V$ ,	2.0	—	—	V	
	$V_{IL}$	$I_{out} \leq 20\mu A$	—	—	0.8	V	
Output Voltage	$V_{OH}$	$V_{in}=V_{IH}$ or $V_{IL}$ , $I_{out} \leq 20\mu A$	$V_{CC}-0.05$	$V_{CC}$	—	V	
	$V_{OL}$		—	0.0	0.05	V	
Output Current	$I_{OH}$	$V_{in}=V_{IH}$ or $V_{IL}$ , $V_{out}=V_{CC}-0.8V$	—	—	-6.0	mA	
	$I_{OL}$	$V_{in}=V_{IH}$ or $V_{IL}$ , $V_{out}=0.4V$	6.0	—	—	mA	
Input Current	$I_{in}$	$V_{in}=V_{CC}$ or GND	—	$\pm 0.00001$	$\pm 1.0$	$\mu A$	
3-state Leakage Current	$I_{TL}$		$T_a=25^\circ C$	—	—	0.5	$\mu A$
			$T_a=85^\circ C$	—	—	5.0	$\mu A$
Quiescent Current	$I_{CC}$	$V_{in}=V_{CC}$ or GND, $I_{out}=0\mu A$	$T_a=25^\circ C$	—	—	4.0	$\mu A$
			$T_a=85^\circ C$	—	—	40	$\mu A$

■ AC CHARACTERISTICS ( $V_{CC}=5V$ ,  $T_a=25^\circ C$ , Input  $t_r=t_f=6ns$ )

Item	Symbol	Test Condition	min	typ	max	Unit
Maximum Clock Frequency	$f_{max}$	$C_L=50pF$	—	—	30	MHz
Propagation Delay Time	$t_{PLH}$	$C_L=50pF$	—	—	28	ns
	$t_{PHL}$		—	—	28	ns
Output Enable Time	$t_{ZL}$	$C_L=50pF$ , $R_L=1k\Omega$	—	—	30	ns
	$t_{ZH}$		—	—	30	
Output Disable Time	$t_{LZ}$	$C_L=50pF$ , $R_L=1k\Omega$	—	—	25	ns
	$t_{HZ}$		—	—	25	
Setup Time	$t_{su}$		20	—	—	ns
Hold Time	$t_h$		—	—	—	ns
Pulse Width	$t_w$		16	—	—	ns
Input Capacitance	$C_{in}$		—	—	10	pF

● Switching Waveforms

Figure 1

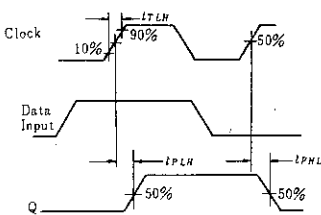


Figure 2a

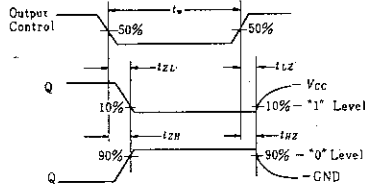


Figure 2b - Load Circuit for Three-State Outputs

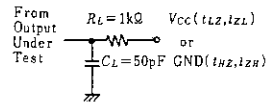
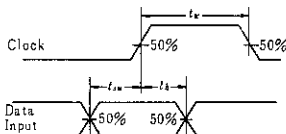
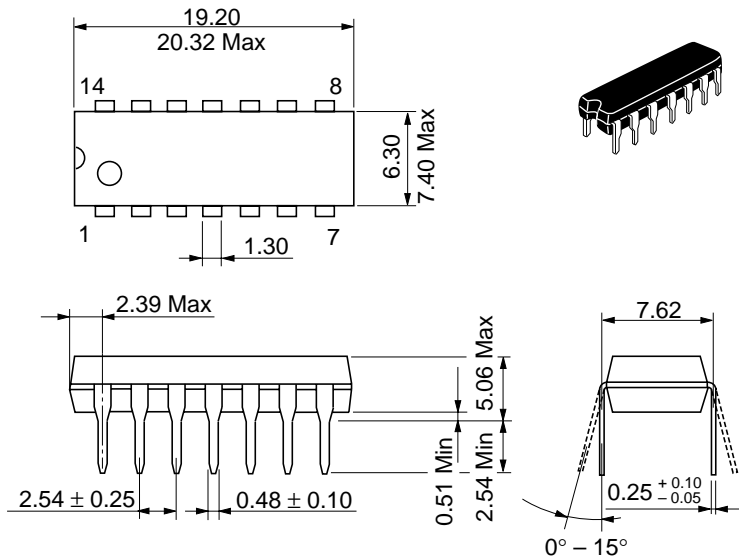


Figure 3



\*Outputs Q shown are for the HCT374. Outputs for the HCT534 are the inversion of those for the HCT374.



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

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## 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  
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