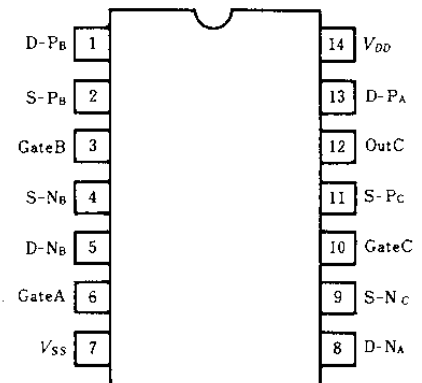# HD14007UB

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.
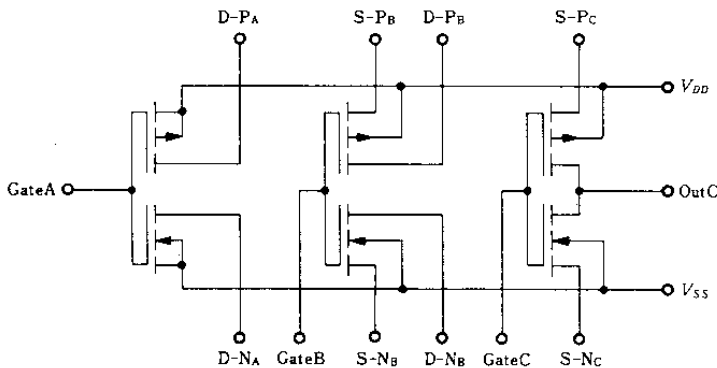
■ FEATURES

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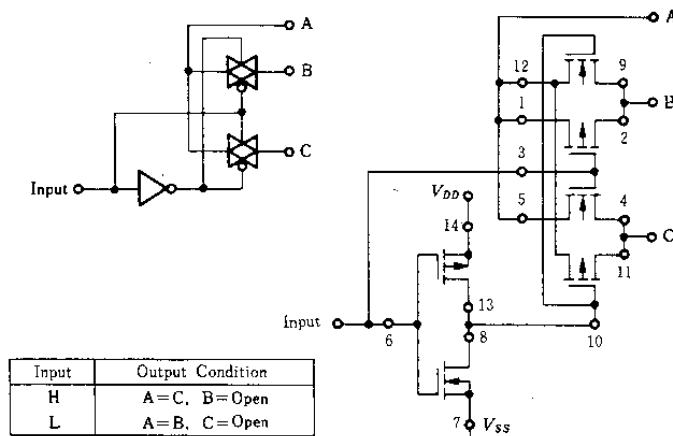
■ PIN ARRANGEMENT

D-P$_B$	1	14 V_{DD}
S-P$_B$	2	13 D-P$_A$
GateB	3	12 OutC
S-N$_B$	4	11 S-P$_C$
D-N$_B$	5	10 GateC
GateA	6	9 S-N$_C$
V_{SS}	7	8 D-N$_A$

(Top View)

■ CIRCUIT SCHEMATIC

■ TYPICAL APPLICATION

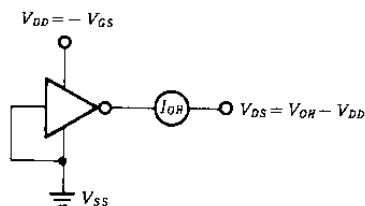(2-input Analog Multiplexer)

Input	Output Condition
H	A = C, B = Open
L	A = B, C = Open

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

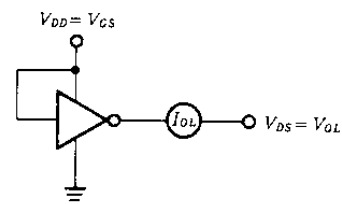### ■ DC CHARACTERISTIC TEST CIRCUIT

● I$_{OH}$ $V_{DD} = -V_{GS}$

$V_{DS} = V_{OH} - V_{DD}$

All unused inputs connected to ground.

● I$_{OL}$ $V_{DD} = V_{GS}$

$V_{DS} = V_{OL}$

All unused inputs connected to ground.

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■ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD}(V)	Test Conditions	−40℃ min	−40℃ max	25℃ min	25℃ typ	25℃ max	85℃ min	85℃ max	Unit
Output Voltage	V_{OL}	5.0	$V_{in}=V_{DD}$ 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_{OH}	5.0	$V_{in}=0$ or V_{DD}	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_{IL}	5.0	$V_{out}=$ 4.5 or 0.5V	—	1.0	—	2.25	1.0	—	1.0	V
		10	$V_{out}=$ 9.0 or 1.0V	—	2.0	—	4.50	2.0	—	2.0	
		15	$V_{out}=$13.5 or 1.5V	—	2.5	—	6.75	2.5	—	2.5	
	V_{IH}	5.0	$V_{out}=$ 0.5 or 4.5V	4.0	—	4.0	2.75	—	4.0	—	V
		10	$V_{out}=$ 1.0 or 9.0V	8.0	—	8.0	5.50	—	8.0	—	
		15	$V_{out}=$ 1.5 or 13.5V	12.5	—	12.5	8.25	—	12.5	—	
Output Drive Current	I_{OH}	5.0	$V_{OH}=$ 2.5V	−1.3	—	−1.1	−5.0	—	−0.9	—	mA
		10	$V_{OH}=$ 9.5V	−0.65	—	−0.55	−2.5	—	−0.45	—	
		15	$V_{OH}=$ 13.5V	−2.4	—	−2.0	−10	—	−1.6	—	
	I_{OL}	5.0	$V_{OL}=$ 0.4V	0.52	—	0.44	1.0	—	0.36	—	mA
		10	$V_{OL}=$ 0.5V	1.3	—	1.1	2.5	—	0.9	—	
		15	$V_{OL}=$ 1.5V	4.0	—	3.3	10	—	2.7	—	
Input Current	I_{in}	15		—	±0.3	—	±0.00001	±0.3	—	±1.0	μA
Input Capacitance	C_{in}		$V_{in}=0$	—	—	—	5.0	7.5	—	—	pF
Quiescent Current	I_{DD}	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_T	5.0	Dynamic+I_{DD}, per Gate, $C_L=$50pF, $f=$1kHz	—	—	—	0.72	—	—	—	μA
		10		—	—	—	1.44	—	—	—	
		15		—	—	—	2.16	—	—	—	

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

@ $V_{DD}=5.0$V $I_T=(0.72\mu A/kHz)f+I_{DD}$, @$V_{DD}=10$V $I_T=(1.44\mu A/kHz)f+I_{DD}$, @$V_{DD}=15$V $I_T=(2.16\mu A/kHz)f+I_{DD}$

■SWITCHING CHARACTERISTICS ($C_L=$50pF, $Ta=$25℃)

Characteristic	Symbol	V_{DD}(V)	typ	max	Unit
Output Rise Time	t_r	5.0	90	180	ns
		10	45	90	
		15	35	70	
Output Fall Time	t_f	5.0	75	150	ns
		10	40	80	
		15	30	60	
Propagation Delay Time	t_{PLH}	5.0	60	130	ns
		10	30	75	
		15	25	55	
	t_{PHL}	5.0	60	130	ns
		10	30	75	
		15	25	55	

■SWITCHING TIME TEST CIRCUIT

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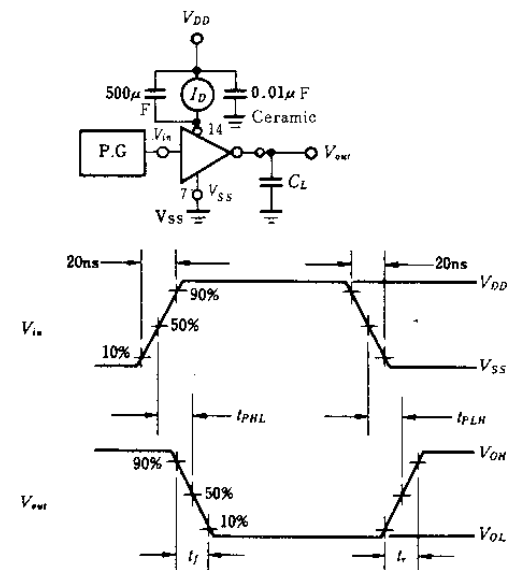
■DC CHARACTERISTICS $(V_{CC}=5V\pm10\%,\ Ta=-40\ to\ +85°C)$

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}	$I_{out}\leqq20\mu A$		—	—	0.8	V
Output Voltage	V_{OH}	$V_{in}=V_{IH}$ or V_{IL}, $I_{out}\leqq20\mu A$		$V_{CC}-0.05$	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		—	±0.00001	±1.0	μA
3-state Leakage Current	I_{TL}		$Ta=25°C$	—	—	0.5	μA
			$Ta=85°C$	—	—	5.0	μA
Quiescent Current	I_{CC}	$V_{in}=V_{CC}$ or GND, $I_{out}=0\mu A$	$Ta=25°C$	—	—	4.0	μA
			$Ta=85°C$	—	—	40	μA

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

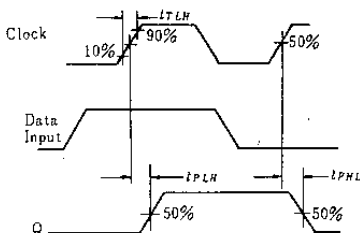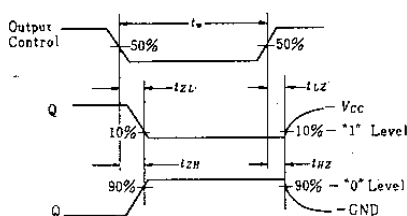| Item	Symbol	Test Condition	min	typ	max	Unit
Maximum Clock Frequency	f_{max}	$C_L=50pF$	—	—	30	MHz
Propagation Delay Time	t_{PLH} t_{PHL}	$C_L=50pF$	—	—	28	ns
Output Enable Time	t_{ZL}	$C_L=50pF,\ R_L=1k\Omega$	—	—	30	ns
	t_{ZH}		—	—	30	
Output Disable Time	t_{LZ}	$C_L=50pF,\ R_L=1k\Omega$	—	—	25	ns
	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

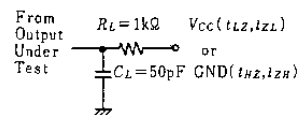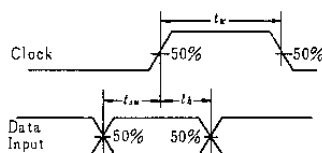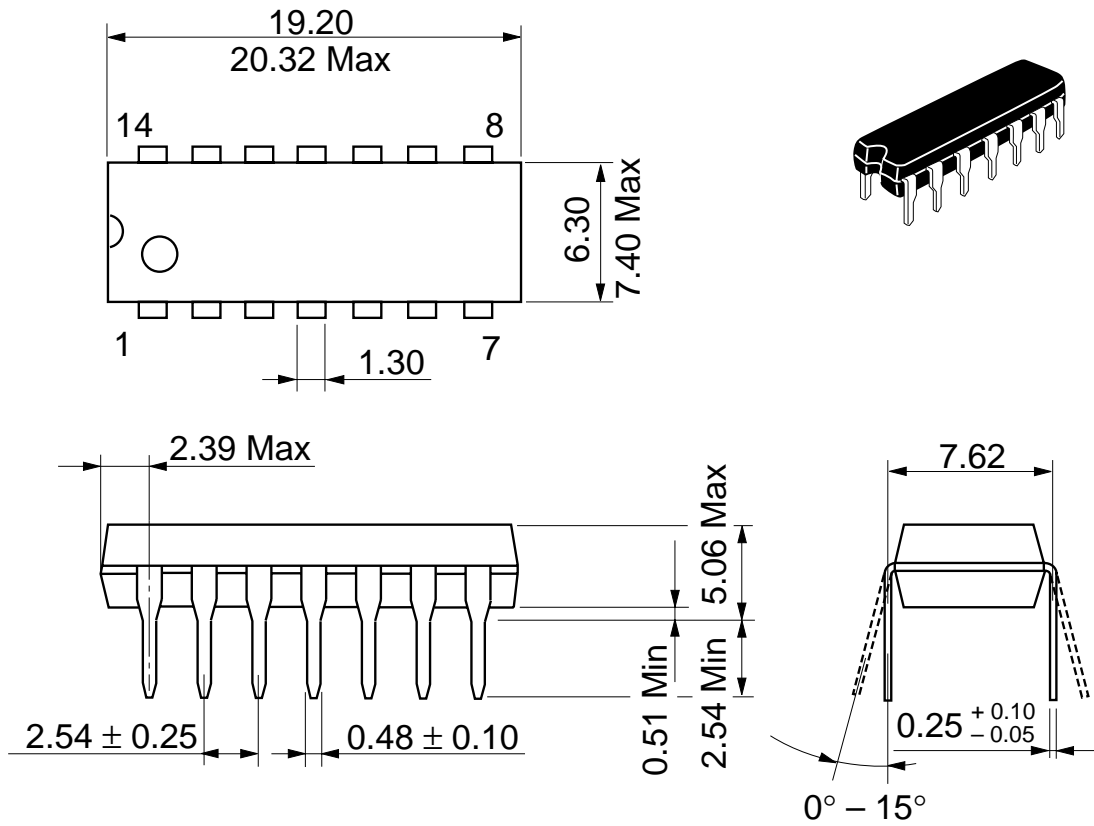### Figure 3

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

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Unit: mm

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

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