

MC14007UB

Dual Complementary Pair Plus Inverter

The MC14007UB multipurpose 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

- Diode Protection on All Inputs
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-power TTL Loads or One Low-power Schottky TTL Load Over the Rated Temperature Range
- Pin-for-Pin Replacement for CD4007A or CD4007UB
- This device has 2 outputs without ESD Protection. Antistatic precautions must be taken.
- These Devices are Pb-Free and are RoHS Compliant
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

MAXIMUM RATINGS (Voltages Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage Range	-0.5 to +18.0	V
V_{in}, V_{out}	Input or Output Voltage Range (DC or Transient)	-0.5 to $V_{DD} + 0.5$	V
I_{in}, I_{out}	Input or Output Current (DC or Transient) per Pin	± 10	mA
P_D	Power Dissipation, per Package (Note 1)	500	mW
T_A	Ambient Temperature Range	-55 to +125	$^{\circ}C$
T_{stg}	Storage Temperature Range	-65 to +150	$^{\circ}C$
T_L	Lead Temperature (8 second Soldering)	260	$^{\circ}C$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Temperature Derating:

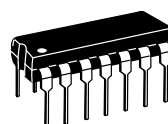
Plastic "P and D/DW" Packages: - 7.0 mW/ $^{\circ}C$ from 65 $^{\circ}C$ to 125 $^{\circ}C$.



ON Semiconductor®

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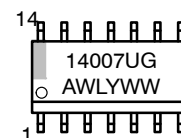
MARKING DIAGRAMS



PDIP-14
P SUFFIX
CASE 646

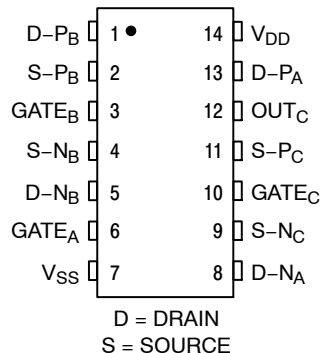


SOIC-14
D SUFFIX
CASE 751A



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G = Pb-Free Indicator

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

MC14007UB

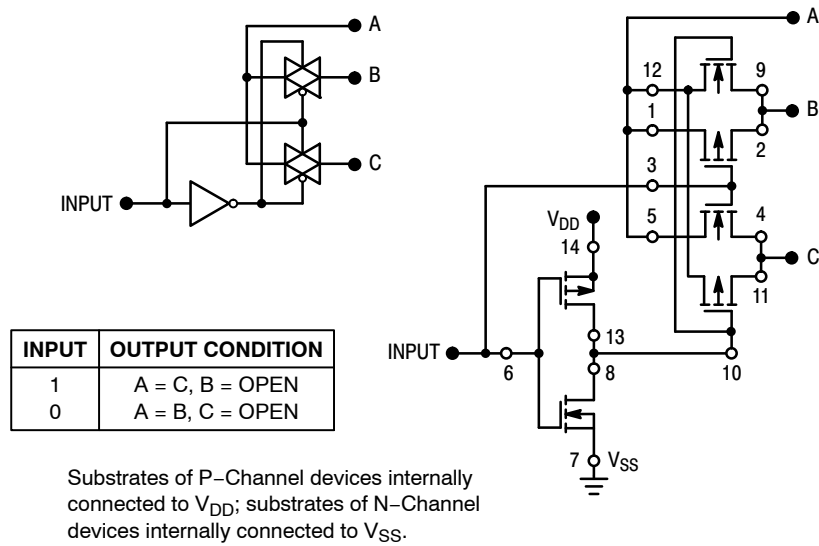


Figure 1. Typical Application: 2-Input Analog Multiplexer

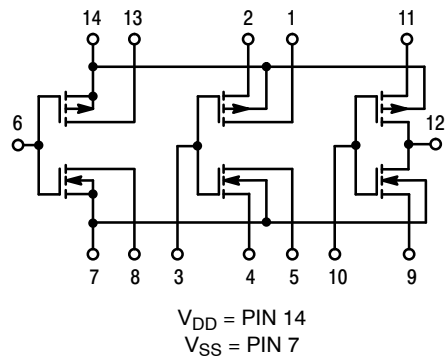


Figure 2. Schematic

MC14007UB

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Symbol	Characteristic	V_{DD} Vdc	-55°C		25°C			125°C		Unit
			Min	Max	Min	Typ (Note 2)	Max	Min	Max	
V_{OL}	Output Voltage "0" Level $V_{in} = V_{DD}$ or 0	5.0	–	0.05	–	0	0.05	–	0.05	Vdc
		10	–	0.05	–	0	0.05	–	0.05	
		15	–	0.05	–	0	0.05	–	0.05	
V_{OH}	$V_{in} = 0$ or V_{DD} "1" Level	5.0	4.95	–	4.95	5.0	–	4.95	–	Vdc
		10	9.95	–	9.95	10	–	9.95	–	
		15	14.95	–	14.95	15	–	14.95	–	
V_{IL}	Input Voltage "0" Level ($V_O = 4.5$ Vdc) ($V_O = 9.0$ Vdc) ($V_O = 13.5$ Vdc)	5.0	–	1.0	–	2.25	1.0	–	1.0	Vdc
		10	–	2.0	–	4.50	2.0	–	2.0	
		15	–	2.5	–	6.75	2.5	–	2.5	
V_{IH}	"1" Level ($V_O = 0.5$ Vdc) ($V_O = 1.0$ Vdc) ($V_O = 1.5$ Vdc)	5.0	4.0	–	4.0	2.75	–	4.0	–	Vdc
		10	8.0	–	8.0	5.50	–	8.0	–	
		15	12.5	–	12.5	8.25	–	12.5	–	
I_{OH}	Output Drive Current Source ($V_{OH} = 2.5$ Vdc) ($V_{OH} = 4.6$ Vdc) ($V_{OH} = 9.5$ Vdc) ($V_{OH} = 13.5$ Vdc)	5.0	–3.0	–	–2.4	–5.0	–	–1.7	–	mAdc
		5.0	–0.64	–	–0.51	–1.0	–	–0.36	–	
		10	–1.6	–	–1.3	–2.5	–	–0.9	–	
		15	–4.2	–	–3.4	–10	–	–2.4	–	
I_{OL}	Sink ($V_{OL} = 0.4$ Vdc) ($V_{OL} = 0.5$ Vdc) ($V_{OL} = 1.5$ Vdc)	5.0	0.64	–	0.51	1.0	–	0.36	–	mAdc
		10	1.6	–	1.3	2.5	–	0.9	–	
		15	4.2	–	3.4	10	–	2.4	–	
I_{in}	Input Current	15	–	±0.1	–	±0.00001	±0.1	–	±1.0	μAdc
C_{in}	Input Capacitance ($V_{in} = 0$)	–	–	–	–	5.0	7.5	–	–	pF
I_{DD}	Quiescent Current (Per Package)	5.0	–	0.25	–	0.0005	0.25	–	7.5	μAdc
		10	–	0.5	–	0.0010	0.5	–	15	
		15	–	1.0	–	0.0015	1.0	–	30	
I_T	Total Supply Current (Notes 3 and 4) (Dynamic plus Quiescent, Per Gate) ($C_L = 50$ pF)	5.0 10 15	$I_T = (0.7 \mu\text{A/kHz}) f + I_{DD}/6$ $I_T = (1.4 \mu\text{A/kHz}) f + I_{DD}/6$ $I_T = (2.2 \mu\text{A/kHz}) f + I_{DD}/6$							μAdc

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

3. The formulas given are for the typical characteristics only at 25°C.

4. To calculate total supply current at loads other than 50 pF: $I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) Vfk$

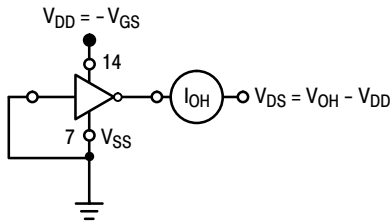
where: I_T is in μA (per package), C_L in pF, $V = (V_{DD} - V_{SS})$ in volts, f in kHz is input frequency, and $k = 0.003$.

MC14007UB

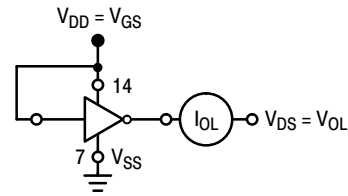
SWITCHING CHARACTERISTICS (Note 5) ($C_L = 50 \text{ pF}$, $T_A = 25^\circ\text{C}$)

Symbol	Characteristic	V_{DD} Vdc	Min	Typ (Note 6)	Max	Unit
t_{TLH}	Output Rise Time					
	$t_{TLH} = (1.2 \text{ ns/pF}) C_L + 30 \text{ ns}$	5.0	-	90	180	ns
	$t_{TLH} = (0.5 \text{ ns/pF}) C_L + 20 \text{ ns}$	10	-	45	90	
	$t_{TLH} = (0.4 \text{ ns/pF}) C_L + 15 \text{ ns}$	15	-	35	70	
t_{THL}	Output Fall Time					
	$t_{THL} = (1.2 \text{ ns/pF}) C_L + 15 \text{ ns}$	5.0	-	75	150	ns
	$t_{THL} = (0.5 \text{ ns/pF}) C_L + 15 \text{ ns}$	10	-	40	80	
	$t_{THL} = (0.4 \text{ ns/pF}) C_L + 10 \text{ ns}$	15	-	30	60	
t_{PLH}	Turn-Off Delay Time					
	$t_{PLH} = (1.5 \text{ ns/pF}) C_L + 35 \text{ ns}$	5.0	-	60	125	ns
	$t_{PLH} = (0.2 \text{ ns/pF}) C_L + 20 \text{ ns}$	10	-	30	75	
	$t_{PLH} = (0.15 \text{ ns/pF}) C_L + 17.5 \text{ ns}$	15	-	25	55	
t_{PHL}	Turn-On Delay Time					
	$t_{PHL} = (1.0 \text{ ns/pF}) C_L + 10 \text{ ns}$	5.0	-	60	125	ns
	$t_{PHL} = (0.3 \text{ ns/pF}) C_L + 15 \text{ ns}$	10	-	30	75	
	$t_{PHL} = (0.2 \text{ ns/pF}) C_L + 15 \text{ ns}$	15	-	25	55	

5. The formulas given are for the typical characteristics only. Switching specifications are for device connected as an inverter.
 6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.



All unused inputs connected to ground.



All unused inputs connected to ground.

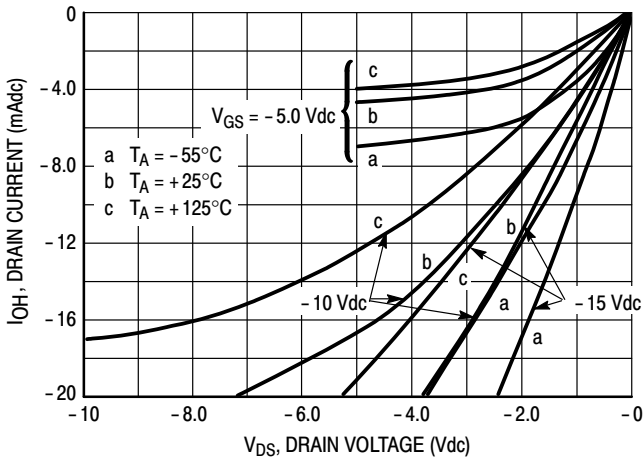


Figure 3. Typical Output Source Characteristics

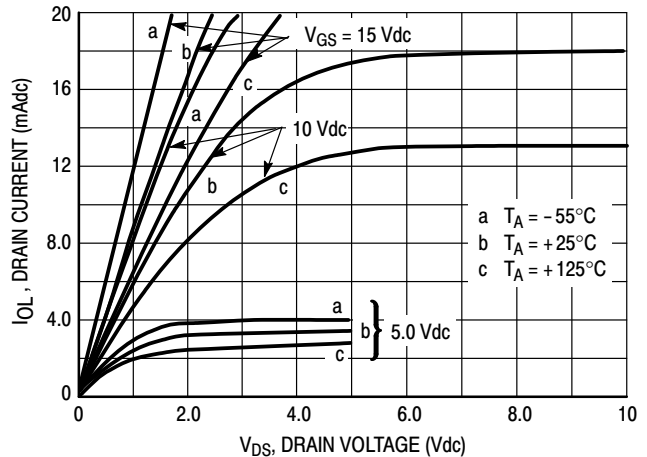


Figure 4. Typical Output Sink Characteristics

These typical curves are not guarantees, but are design aids.
 Caution: The maximum current rating is 10 mA per pin.

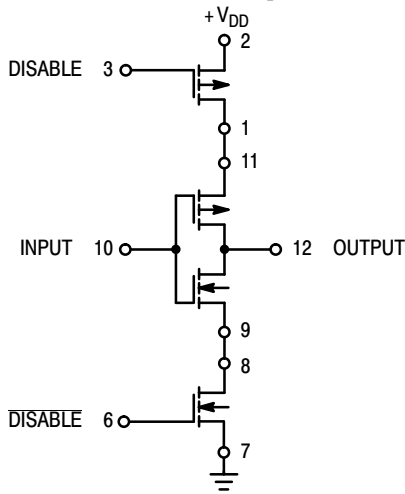
MC14007UB



Figure 5. Switching Time and Power Dissipation Test Circuit and Waveforms

APPLICATIONS

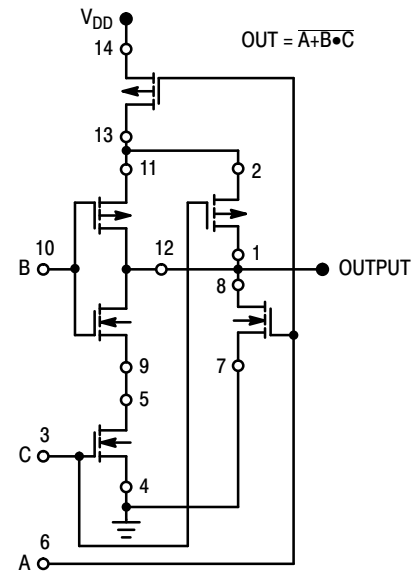
The MC14007UB dual pair plus inverter, which has access to all its elements offers a number of unique circuit applications. Figures 1, 6, and 7 are a few examples of the device flexibility.



INPUT	DISABLE	OUTPUT
1	0	0
0	0	1
X	1	OPEN

X = Don't Care

Figure 6. 3-State Buffer



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

Figure 7. AOI Functions Using Tree Logic

MC14007UB

ORDERING INFORMATION

Device	Package	Shipping†
MC14007UBCPG	PDIP-14 (Pb-Free)	25 Units / Rail
MC14007UBDG	SOIC-14 (Pb-Free)	55 Units / Rail
MC14007UBDR2G	SOIC-14 (Pb-Free)	2500 / Tape & Reel
NLV14007UBDR2G*		

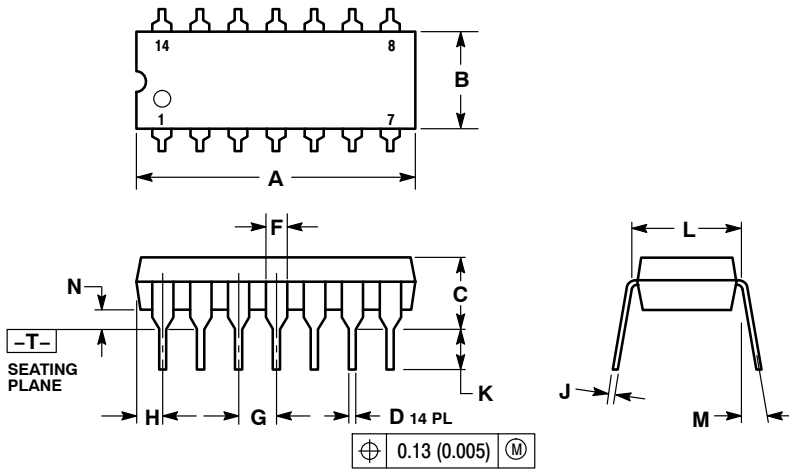
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

MC14007UB

PACKAGE DIMENSIONS

PDIP-14
CASE 646-06
ISSUE P



NOTES:

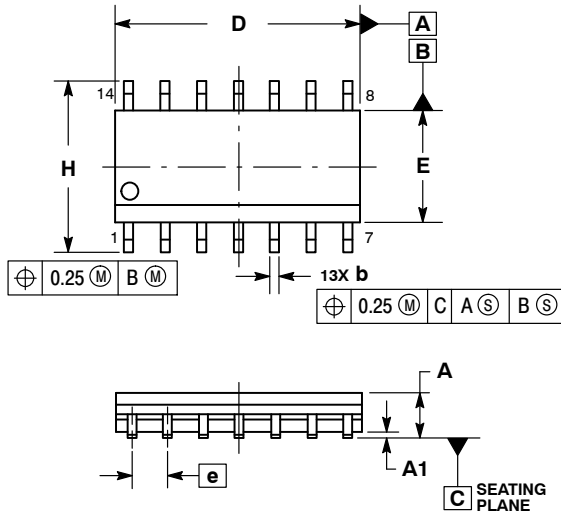
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	---	10°	---	10°
N	0.015	0.039	0.38	1.01

MC14007UB

PACKAGE DIMENSIONS

SOIC-14 NB
CASE 751A-03
ISSUE K

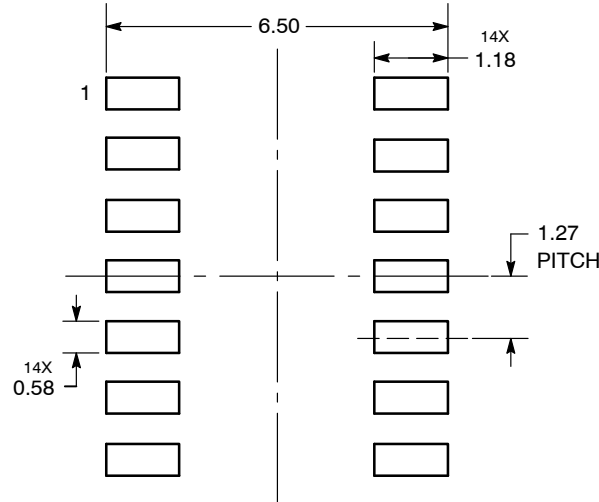


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0°	7°	0°	7°

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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