MC14001UB, MC14011UB

UB-Suffix Series CMOS Gates

The UB Series logic gates are constructed with P and N channel enhancement mode devices in a single monolithic structure (Complementary MOS). Their primary use is where low power dissipation and/or high noise immunity is desired. The UB set of CMOS gates are inverting non−buffered functions.

Features

- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Linear and Oscillator Applications
- Capable of Driving Two Low−Power TTL Loads or One Low−Power Schottky TTL Load Over the Rated Temperature Range
- Double Diode Protection on All Inputs
- Pin−for−Pin Replacements for Corresponding CD4000 Series UB Suffix Devices
- Pb−Free Packages are Available

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	°C
T_{stg}	Storage Temperature Range	−65 to +150	°C
T_L	Lead Temperature (8−Second Soldering)	260	°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/°C From 65°C To 125°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high−impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $V_{SS} \le (V_{in}$ or $V_{out}) \le V_{DD}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.

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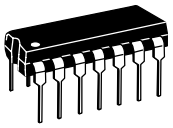
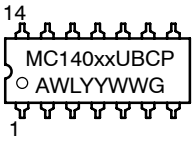
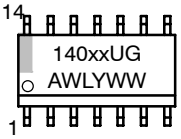
MARKING DIAGRAMS



PDIP−14
P SUFFIX
CASE 646



SOIC−14
D SUFFIX
CASE 751A

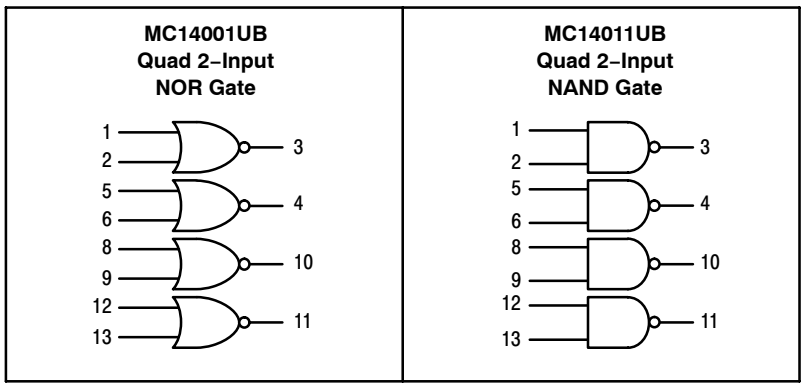


xx	= Specific Device Code
A	= Assembly Location
WL, L	= Wafer Lot
YY, Y	= Year
WW, W	= Work Week
G	= Pb−Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

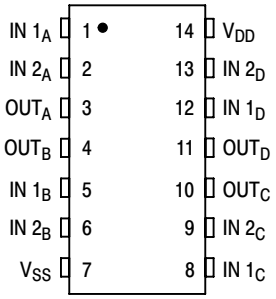
LOGIC DIAGRAMS



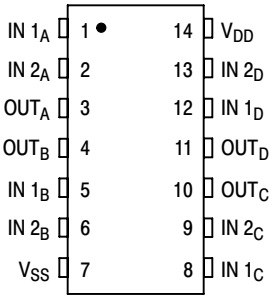
V_{DD} = PIN 14
V_{SS} = PIN 7
FOR ALL DEVICES

PIN ASSIGNMENTS

MC14001UB
Quad 2−Input NOR Gate



MC14011UB
Quad 2−Input NAND Gate



ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	– 55°C Min	– 55°C Max	25°C Min	25°C Typ (Note 2)	25°C Max	125°C Min	125°C Max	Unit
Output Voltage "0" Level V_{in} = V_{DD} or 0	V_{OL}	5.0 10 15	– – –	0.05 0.05 0.05	– – –	0 0 0	0.05 0.05 0.05	– – –	0.05 0.05 0.05	Vdc
V_{in} = 0 or V_{DD} "1" Level	V_{OH}	5.0 10 15	4.95 9.95 14.95	– – –	4.95 9.95 14.95	5.0 10 15	– – –	4.95 9.95 14.95	– – –	Vdc
Input Voltage "0" Level (V_O = 4.5 Vdc) (V_O = 9.0 Vdc) (V_O = 13.5 Vdc)	V_{IL}	5.0 10 15	– – –	1.0 2.0 2.5	– – –	2.25 4.50 6.75	1.0 2.0 2.5	– – –	1.0 2.0 2.5	Vdc
(V_O = 0.5 Vdc) "1" Level (V_O = 1.0 Vdc) (V_O = 1.5 Vdc)	I_{IH}	5.0 10 15	4.0 8.0 12.5	– – –	4.0 8.0 12.5	2.75 5.50 8.25	– – –	4.0 8.0 12.5	– – –	Vdc
Output Drive Current (V_{OH} = 2.5 Vdc) Source (V_{OH} = 4.6 Vdc) (V_{OH} = 9.5 Vdc) (V_{OH} = 13.5 Vdc)	I_{OH}	5.0 5.0 10 15	– 1.2 – 0.25 – 0.62 – 1.8	– – – –	– 1.0 – 0.2 – 0.5 – 1.5	– 1.7 – 0.36 – 0.9 – 3.5	– – – –	– 0.7 – 0.14 – 0.35 – 1.1	– – – –	mAdc
(V_{OL} = 0.4 Vdc) Sink (V_{OL} = 0.5 Vdc) (V_{OL} = 1.5 Vdc)	I_{OL}	5.0 10 15	0.64 1.6 4.2	– – –	0.51 1.3 3.4	0.88 2.25 8.8	– – –	0.36 0.9 2.4	– – –	mAdc
Input Current	I_{in}	15	–	± 0.1	–	±0.00001	± 0.1	–	± 1.0	μAdc
Input Capacitance (V_{in} = 0)	C_{in}	–	–	–	–	5.0	7.5	–	–	pF
Quiescent Current (Per Package)	I_{DD}	5.0 10 15	– – –	0.25 0.5 1.0	– – –	0.0005 0.0010 0.0015	0.25 0.5 1.0	– – –	7.5 15 30	μAdc
Total Supply Current (Notes 3, 4) (Dynamic plus Quiescent, Per Gate C_L = 50 pF)	I_T	5.0 10 15	I_T = (0.3 μA/kHz) f + I_{DD}/N I_T = (0.6 μA/kHz) f + I_{DD}/N I_T = (0.8 μA/kHz) f + I_{DD}/N							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:

$$I_T(C_L) = I_T(50\ pF) + (C_L - 50)\ Vfk$$

where: I_T is in μH (per package), C_L in pF, V = (V_{DD} – V_{SS}) in volts, f in kHz is input frequency, and k = 0.001 x the number of exercised gates per package.

SWITCHING CHARACTERISTICS (Note 5) (C_L = 50 pF, T_A = 25°C)

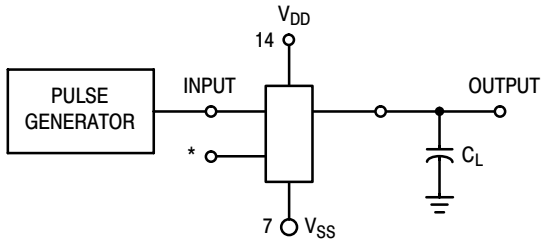
Characteristic	Symbol	V_{DD} Vdc	Min	Typ (Note 6)	Max	Unit
Output Rise Time t_{TLH} = (3.0 ns/pF) C_L + 30 ns t_{TLH} = (1.5 ns/pF) C_L + 15 ns t_{TLH} = (1.1 ns/pF) C_L + 10 ns	t_{TLH}	5.0 10 15	– – –	180 90 65	360 180 130	ns
Output Fall Time t_{THL} = (1.5 ns/pF) C_L + 25 ns t_{THL} = (0.75 ns/pF) C_L + 12.5 ns t_{THL} = (0.55 ns/pF) C_L + 9.5 ns	t_{THL}	5.0 10 15	– – –	100 50 40	200 100 80	ns
Propagation Delay Time t_{PLH}, t_{PHL} = (1.7 ns/pF) C_L + 30 ns t_{PLH}, t_{PHL} = (0.66 ns/pF) C_L + 22 ns t_{PLH}, t_{PHL} = (0.50 ns/pF) C_L + 15 ns	t_{PLH}, t_{PHL}	5.0 10 15	– – –	90 50 40	180 100 80	ns

5. The formulas given are for the typical characteristics only at 25°C.
6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

ORDERING INFORMATION

Device	Package	Shipping†
MC14001UBCP	PDIP−14	25 Units / Rail
MC14001UBCPG	PDIP−14 (Pb−Free)	
MC14001UBD	SOIC−14	55 Units / Rail
MC14001UBDG	SOIC−14 (Pb−Free)	
MC14001UBDR2	SOIC−14	2500 / Tape & Reel
MC14001UBDR2G	SOIC−14 (Pb−Free)	
MC14011UBCP	PDIP−14	25 Units / Rail
MC14011UBCPG	PDIP−14 (Pb−Free)	
MC14011UBD	SOIC−14	55 Units / Rail
MC14011UBDG	SOIC−14 (Pb−Free)	
MC14011UBDR2	SOIC−14	2500 / Tape & Reel
MC14011UBDR2G	SOIC−14 (Pb−Free)	

†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.



*All unused inputs of AND, NAND gates must be connected to V_{DD}.
All unused inputs of OR, NOR gates must be connected to V_{SS}.

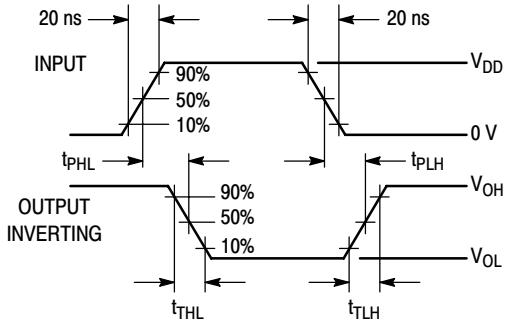
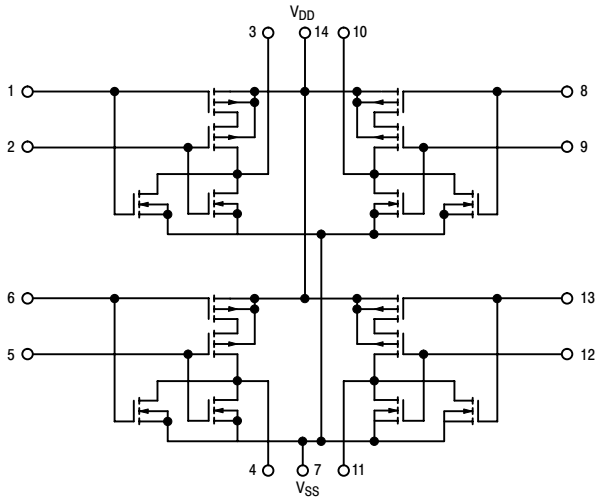
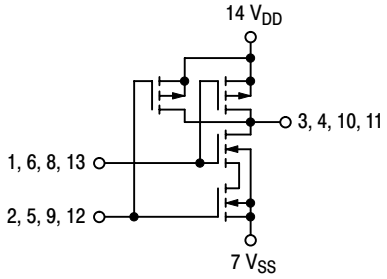


Figure 1. Switching Time Test Circuit and Waveforms

MC14001UB CIRCUIT SCHEMATIC



MC14011UB CIRCUIT SCHEMATIC
(1/4 of Device Shown)



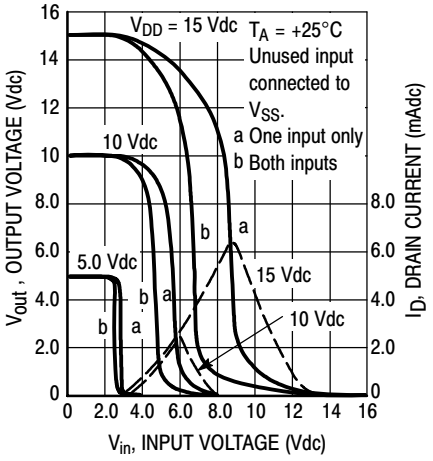


Figure 2. Typical Voltage and Current Transfer Characteristics

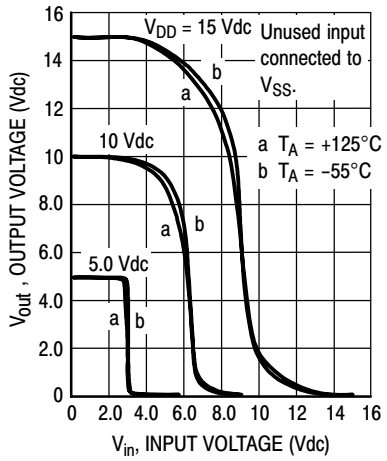


Figure 3. Typical Voltage Transfer Characteristics versus Temperature

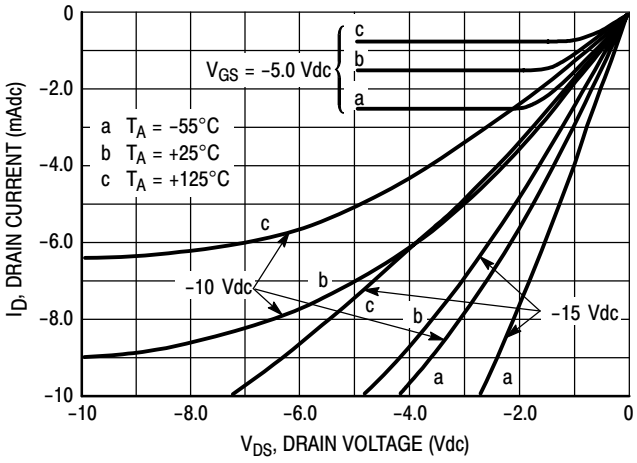


Figure 4. Typical Output Source Characteristics

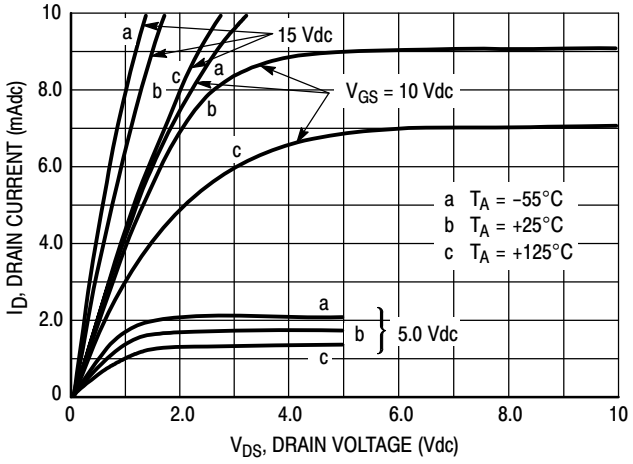
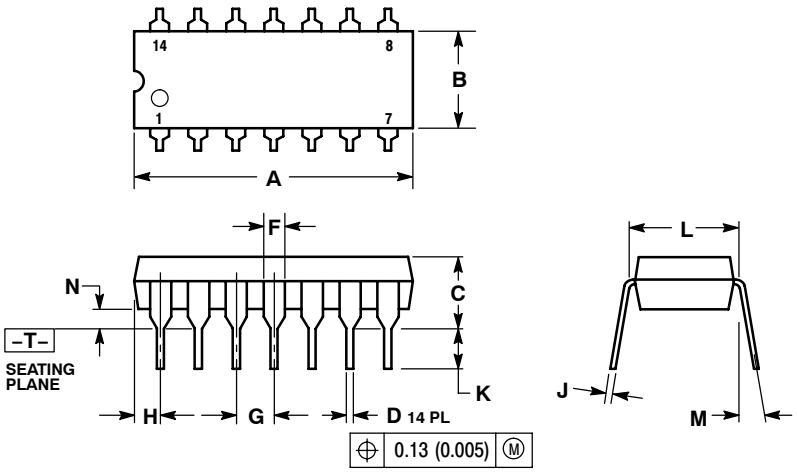


Figure 5. Typical Output Sink Characteristics

PACKAGE DIMENSIONS

PDIP−14
CASE 646−06
ISSUE P

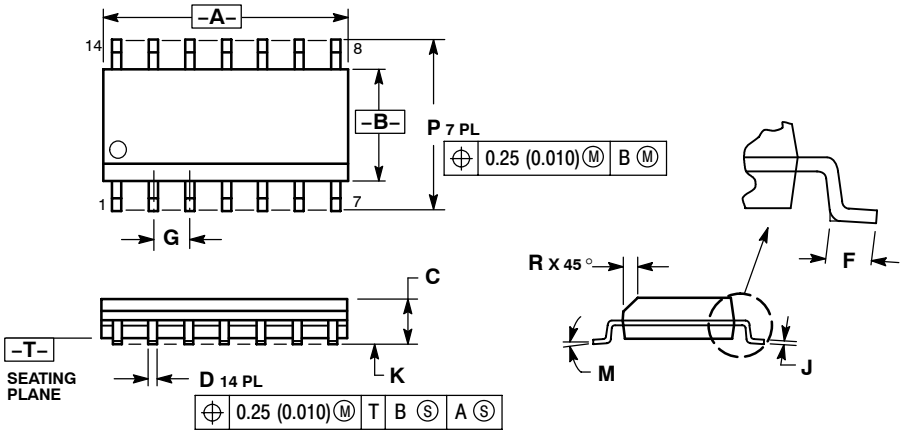


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

	INCHES		MILLIMETERS	
DIM	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

PACKAGE DIMENSIONS

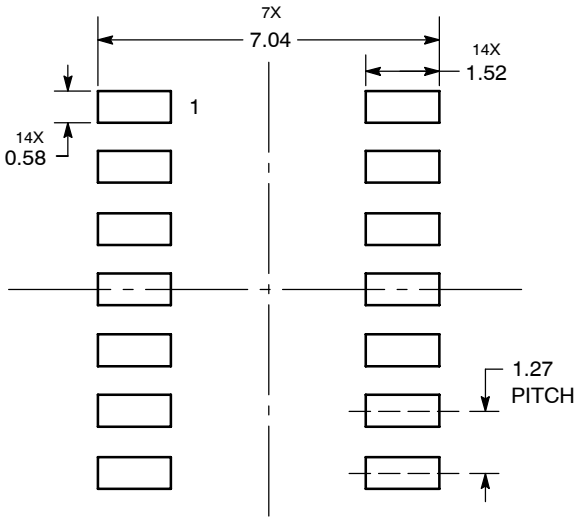
SOIC−14
CASE 751A−03
ISSUE H



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0 °	7 °	0 °	7 °
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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P.O. Box 5163, Denver, Colorado 80217 USA
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MC14001UB/D