

MC14070B, MC14077B

CMOS SSI

Quad Exclusive “OR” and “NOR” Gates

The MC14070B quad exclusive OR gate and the MC14077B quad exclusive NOR gate are constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. These complementary MOS logic gates find primary use where low power dissipation and/or high noise immunity is desired.

Features

- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- All Outputs Buffered
- 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
- MC14070B – Replacement for CD4030B and CD4070B Types
- MC14077B – Replacement for CD4077B Type
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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 those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Temperature Derating: “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 $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$.

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.



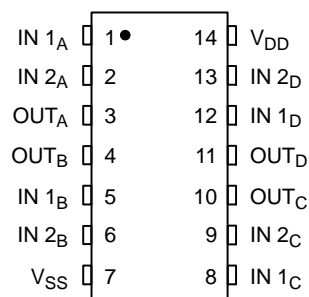
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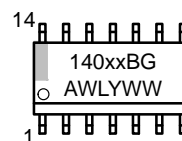


SOIC-14
D SUFFIX
CASE 751A

PIN ASSIGNMENT



MARKING DIAGRAM



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.

MC14070B, MC14077B

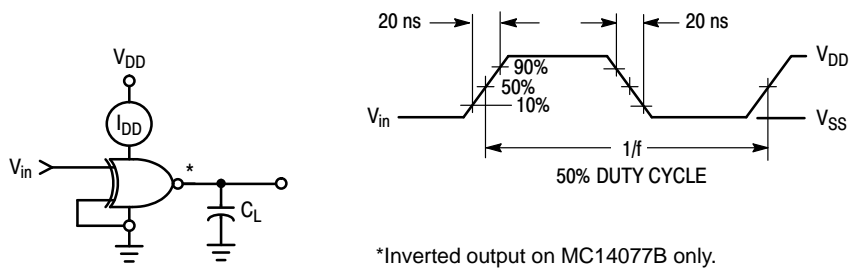
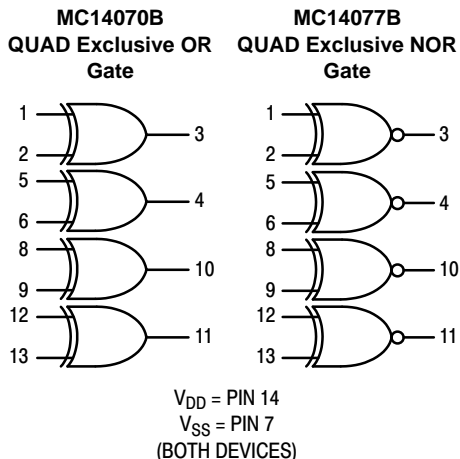


Figure 1. Power Dissipation Test Circuit and Waveform

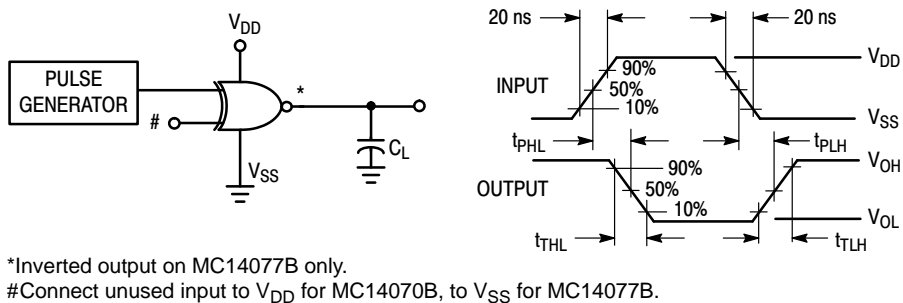


Figure 2. Switching Time Test Circuit and Waveforms

MC14070B, MC14077B

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	-55°C		25°C			125°C		Unit		
			Min	Max	Min	Typ (Note 2)	Max	Min	Max			
Output Voltage $V_{in} = V_{DD}$ or 0	"0" Level	V_{OL}	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		
	$V_{in} = 0$ or V_{DD}	"1" Level	V_{OH}	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	–	
Input Voltage ($V_O = 4.5$ or 0.5 Vdc) ($V_O = 9.0$ or 1.0 Vdc) ($V_O = 13.5$ or 1.5 Vdc)	"0" Level	V_{IL}	5.0	–	1.5	–	2.25	1.5	–	1.5	Vdc	
			10	–	3.0	–	4.50	3.0	–	3.0		
			15	–	4.0	–	6.75	4.0	–	4.0		
	$V_O = 0.5$ or 4.5 Vdc) ($V_O = 1.0$ or 9.0 Vdc) ($V_O = 1.5$ or 13.5 Vdc)	"1" Level	V_{IH}	5.0	3.5	–	3.5	2.75	–	3.5	–	Vdc
				10	7.0	–	7.0	5.50	–	7.0	–	
				15	11	–	11	8.25	–	11	–	
Output Drive Current ($V_{OH} = 2.5$ Vdc) ($V_{OH} = 4.6$ Vdc) ($V_{OH} = 9.5$ Vdc) ($V_{OH} = 13.5$ Vdc)	Source	I_{OH}	5.0	–3.0	–	–2.4	–4.2	–	–1.7	–	mA _{dc}	
			5.0	–0.64	–	–0.51	–0.88	–	–0.36	–		
			10	–1.6	–	–1.3	–2.25	–	–0.9	–		
			15	–4.2	–	–3.4	–8.8	–	–2.4	–		
	$V_{OL} = 0.4$ Vdc) ($V_{OL} = 0.5$ Vdc) ($V_{OL} = 1.5$ Vdc)	Sink	I_{OL}	5.0	0.64	–	0.51	0.88	–	0.36	–	mA _{dc}
				10	1.6	–	1.3	2.25	–	0.9	–	
15	4.2	–	3.4	8.8	–	2.4	–	–				
Input Current	I_{in}	15	–	±0.1	–	±0.00001	±0.1	–	±1.0	µA _{dc}		
Input Capacitance ($V_{in} = 0$)	C_{in}	–	–	–	–	5.0	7.5	–	–	pF		
Quiescent Current (Per Package)	I_{DD}	5.0	–	0.25	–	0.0005	0.25	–	7.5	µA _{dc}		
		10	–	0.5	–	0.0010	0.5	–	15			
		15	–	1.0	–	0.0015	1.0	–	30			
Total Supply Current (Notes 3 & 4) (Dynamic plus Quiescent, Per Package) ($C_L = 50$ pF on all outputs, all buffers switching)	I_T	5.0	$I_T = (0.3 \mu A/kHz) f + I_{DD}$							µA _{dc}		
		10	$I_T = (0.6 \mu A/kHz) f + I_{DD}$									
		15	$I_T = (0.9 \mu A/kHz) f + I_{DD}$									
Output Rise and Fall Times (Note 3) ($C_L = 50$ pF) $t_{TLH}, t_{THL} = (1.35 \text{ ns/pF}) C_L + 33 \text{ ns}$ $t_{TLH}, t_{THL} = (0.60 \text{ ns/pF}) C_L + 20 \text{ ns}$ $t_{TLH}, t_{THL} = (0.40 \text{ ns/pF}) C_L + 20 \text{ ns}$	$t_{TLH},$ t_{THL}	5.0	–	–	–	100	200	–	–	ns		
		10	–	–	–	50	100	–	–			
		15	–	–	–	40	80	–	–			
		–	–	–	–	–	–	–	–			
Propagation Delay Times (Note 3) ($C_L = 50$ pF) $t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 130 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 57 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 37 \text{ ns}$	$t_{PLH},$ t_{PHL}	5.0	–	–	–	175	350	–	–	ns		
		10	–	–	–	75	150	–	–			
		15	–	–	–	55	110	–	–			
		–	–	–	–	–	–	–	–			

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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 µH (per package), C_L in pF, $V = (V_{DD} - V_{SS})$ in volts, f in kHz is input frequency, and $k = 0.002$.

MC14070B, MC14077B

ORDERING INFORMATION

Device	Package	Shipping†
MC14070BDG	SOIC-14 (Pb-Free)	55 Units / Rail
MC14070BDR2G	SOIC-14 (Pb-Free)	2500 / Tape & Reel
NLV14070BDR2G*	SOIC-14 (Pb-Free)	2500 / Tape & Reel

MC14077BDG	SOIC-14 (Pb-Free)	55 Units / Rail
MC14077BDR2G	SOIC-14 (Pb-Free)	2500 / Tape & Reel
NLV14077BDR2G*	SOIC-14 (Pb-Free)	2500 / Tape & Reel

†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.

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

SOIC-14 NB
CASE 751A-03
ISSUE L

DATE 03 FEB 2016



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.

GENERIC MARKING DIAGRAM*



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

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SOIC-14
CASE 751A-03
ISSUE L

DATE 03 FEB 2016

STYLE 1:
 PIN 1. COMMON CATHODE
 2. ANODE/CATHODE
 3. ANODE/CATHODE
 4. NO CONNECTION
 5. ANODE/CATHODE
 6. NO CONNECTION
 7. ANODE/CATHODE
 8. ANODE/CATHODE
 9. ANODE/CATHODE
 10. NO CONNECTION
 11. ANODE/CATHODE
 12. ANODE/CATHODE
 13. NO CONNECTION
 14. COMMON ANODE

STYLE 2:
 CANCELLED

STYLE 3:
 PIN 1. NO CONNECTION
 2. ANODE
 3. ANODE
 4. NO CONNECTION
 5. ANODE
 6. NO CONNECTION
 7. ANODE
 8. ANODE
 9. ANODE
 10. NO CONNECTION
 11. ANODE
 12. ANODE
 13. NO CONNECTION
 14. COMMON CATHODE

STYLE 4:
 PIN 1. NO CONNECTION
 2. CATHODE
 3. CATHODE
 4. NO CONNECTION
 5. CATHODE
 6. NO CONNECTION
 7. CATHODE
 8. CATHODE
 9. CATHODE
 10. NO CONNECTION
 11. CATHODE
 12. CATHODE
 13. NO CONNECTION
 14. COMMON ANODE

STYLE 5:
 PIN 1. COMMON CATHODE
 2. ANODE/CATHODE
 3. ANODE/CATHODE
 4. ANODE/CATHODE
 5. ANODE/CATHODE
 6. NO CONNECTION
 7. COMMON ANODE
 8. COMMON CATHODE
 9. ANODE/CATHODE
 10. ANODE/CATHODE
 11. ANODE/CATHODE
 12. ANODE/CATHODE
 13. NO CONNECTION
 14. COMMON ANODE

STYLE 6:
 PIN 1. CATHODE
 2. CATHODE
 3. CATHODE
 4. CATHODE
 5. CATHODE
 6. CATHODE
 7. CATHODE
 8. ANODE
 9. ANODE
 10. ANODE
 11. ANODE
 12. ANODE
 13. ANODE
 14. ANODE

STYLE 7:
 PIN 1. ANODE/CATHODE
 2. COMMON ANODE
 3. COMMON CATHODE
 4. ANODE/CATHODE
 5. ANODE/CATHODE
 6. ANODE/CATHODE
 7. ANODE/CATHODE
 8. ANODE/CATHODE
 9. ANODE/CATHODE
 10. ANODE/CATHODE
 11. COMMON CATHODE
 12. COMMON ANODE
 13. ANODE/CATHODE
 14. ANODE/CATHODE

STYLE 8:
 PIN 1. COMMON CATHODE
 2. ANODE/CATHODE
 3. ANODE/CATHODE
 4. NO CONNECTION
 5. ANODE/CATHODE
 6. ANODE/CATHODE
 7. COMMON ANODE
 8. COMMON ANODE
 9. ANODE/CATHODE
 10. ANODE/CATHODE
 11. NO CONNECTION
 12. ANODE/CATHODE
 13. ANODE/CATHODE
 14. COMMON CATHODE

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