FAIRCHILD
SEMICONDUCTOR ™

DM7438 • 7438
Quad 2-Input NAND Buffers with Open-Collector Outputs

General Description

This device contains four independent gates each of which performs the logic NAND function. The open-collector outputs require external pull-up resistors for proper logical operation.

Pull-Up Resistor Equations

$$R_{MAX} = \frac{V_{CC} \ (Min) - V_{OH}}{N_1 \ (I_{OH}) + N_2 \ (I_{IH})}$$

$$R_{MIN} = \frac{V_{CC} \ (Max) - V_{OL}}{I_{OL} - N_3 \ (I_{IL})}$$

Where: $N_1 \ (I_{OH})$ = total maximum output high current for all outputs tied to pull-up resistor

$N_2 \ (I_{IH})$ = total maximum input high current for all inputs tied to pull-up resistor

$N_3 \ (I_{IL})$ = total maximum input low current for all inputs tied to pull-up resistor

Ordering Code:

Order Number	Package Number	Package Description
DM7438M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
DM7438N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
7438SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Function Table

$$Y = \overline{AB}$$
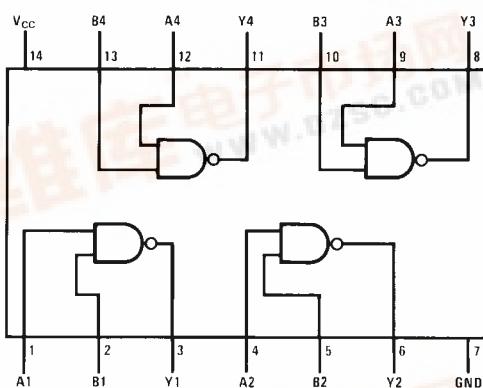
Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = HIGH Logic Level
L = LOW Logic Level

DM7438 • 7438 Quad 2-Input NAND Buffers with Open-Collector Outputs

Absolute Maximum Ratings(Note 1)

Supply Voltage	7V
Input Voltage	5.5V
Output Voltage	7V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	Min	Nom	Max	Units
V_{CC}	Supply Voltage	4.75	5	5.25	V
V_{IH}	HIGH Level Input Voltage	2			V
V_{IL}	LOW Level Input Voltage			0.8	V
V_{OH}	HIGH Level Output Voltage			5.5	V
I_{OL}	LOW Level Output Current			48	mA
T_A	Free Air Operating Temperature	0		70	°C

Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −12 mA			−1.5	V
I_{CEX}	HIGH Level Output Current	V_{CC} = Min, V_O = 5.5V V_{IL} = Max			250	μA
V_{OL}	LOW Level Output Voltage	V_{CC} = Min, I_{OL} = Max V_{IH} = Min			0.4	V
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 5.5V			1	mA
I_{IH}	HIGH Level Input Current	V_{CC} = Max, V_I = 2.4V			40	μA
I_{IL}	LOW Level Input Current	V_{CC} = Max, V_I = 0.4V			−1.6	mA
I_{CCH}	Supply Current with Outputs HIGH	V_{CC} = Max		5	8.5	mA
I_{CCL}	Supply Current with Outputs LOW	V_{CC} = Max		34	54	mA

Switching Characteristics

at V_{CC} = 5V and T_A = 25°C

| Symbol	Parameter	Conditions	Min	Max	Units
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	C_L = 45 pF R_L = 133Ω		22	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output			18	ns

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Physical Dimensions inches (millimeters) unless otherwise noted

0.335 − 0.344
(8.509 − 8.738)

14 13 12 11 10 9 8

0.228 − 0.244
(5.791 − 6.198)

LEAD NO. 1
IDENT

1 2 3 4 5 6 7

30°
TYP

0.010 MAX
(0.254)

0.150 − 0.157
(3.810 − 3.988)

0.010 − 0.020
(0.254 − 0.508) × 45°

8° MAX TYP
ALL LEADS

0.008 − 0.010
(0.203 − 0.254)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 − 0.050
(0.406 − 1.270)
TYP ALL LEADS

0.053 − 0.069
(1.346 − 1.753)

SEATING
PLANE

0.014
(0.356)

0.050
(1.270)
TYP

0.008
(0.203) TYP

0.004 − 0.010
(0.102 − 0.254)

0.014 − 0.020
(0.356 − 0.508) TYP

M14A (REV H)
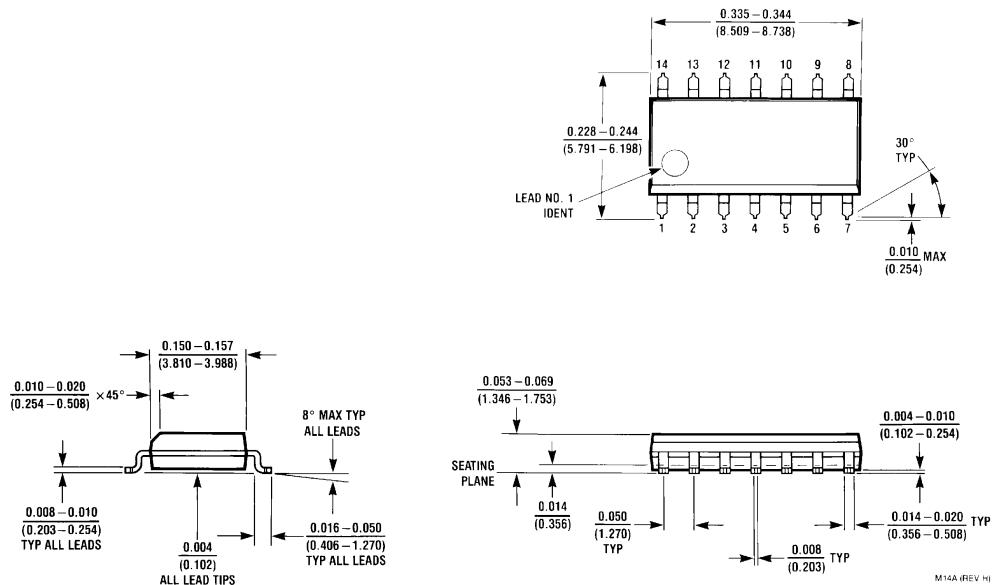
14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

10.2±0.1
-A-

1.1 TYP

14   8

7.8

3.9

5.3±0.1
-B-

PIN #1 IDENT.

1   7

⌒ 0.2 C B A
ALL LEAD TIPS

14   13   9   8

5.01 TYP

9.27 TYP

(2.13 TYP)

1   2   6   7

1.27 TYP   0.6 TYP

LAND PATTERN RECOMMENDATION

ALL LEAD TIPS
⌒ 0.1 C

2.1 MAX.

1.8±0.1

-C-

1.27 TYP   0.35-0.51

0.15±0.05

⊕ 0.12 Ⓜ C A

DIMENSIONS ARE IN MILLIMETERS

SEE DETAIL A

0.15-0.25
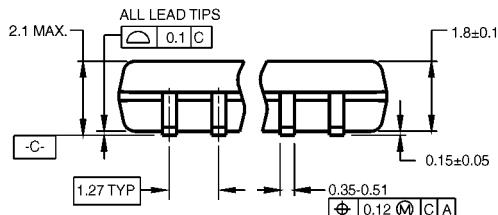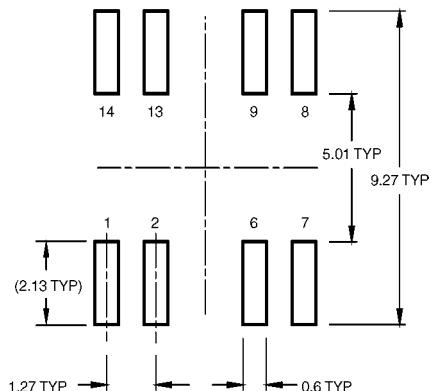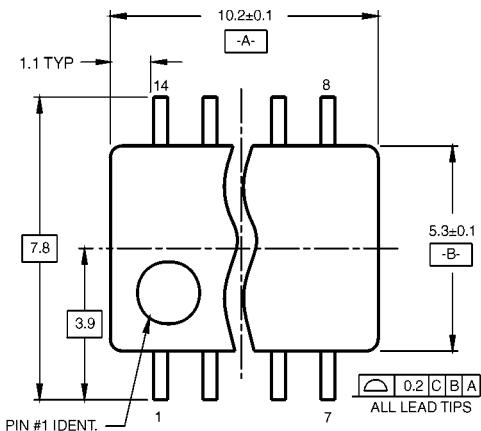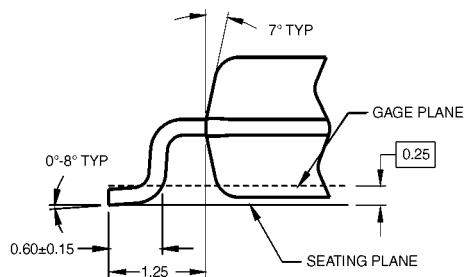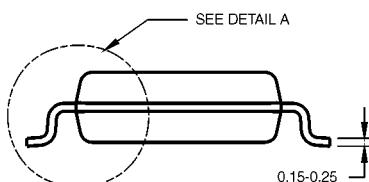
NOTES:
A. CONFORMS TO EIAJ EDR-7320 REGISTRATION,
   ESTABLISHED IN DECEMBER, 1998.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD
   FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1

7° TYP

GAGE PLANE

0°-8° TYP

0.25

0.60±0.15

1.25

SEATING PLANE

DETAIL A

14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M14D

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

0.740 − 0.770
(18.80 − 19.56)

0.090
(2.286)

14 13 12 11 10 9 8

0.250 ± 0.010
(6.350 ± 0.254)

PIN NO. 1
IDENT

1 2 3 4 5 6 7

0.092
(2.337) DIA   0.030 MAX
(0.762) DEPTH

OPTION 1

INDEX
AREA

14 13 12

PIN NO. 1
IDENT

1 2 3

OPTION 02

0.135 ± 0.005
(3.429 ± 0.127)

0.145 − 0.200
(3.683 − 5.080)

0.060 TYP
(1.524)

4° TYP
OPTIONAL

0.020
(0.508)
MIN

0.125 − 0.150
(3.175 − 3.810)

90° ± 4° TYP

0.075 ± 0.015
(1.905 ± 0.381)

0.014 − 0.023 TYP
(0.356 − 0.584)

0.100 ± 0.010 TYP
(2.540 ± 0.254)

0.050 ± 0.010 TYP
(1.270 − 0.254)

0.300 − 0.320
(7.620 − 8.128)

0.065
(1.651)

95° ± 5°

0.008 − 0.016 TYP
(0.203 − 0.406)

0.280
(7.112)
MIN

$0.325 {+0.040 \atop -0.015}$

$\left(8.255 {+1.016 \atop -0.381}\right)$

N14A (REV F)

14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N14A