

# MC14001B Series

## B-Suffix Series CMOS Gates

MC14001B, MC14011B, MC14023B,  
MC14025B, MC14071B, MC14073B,  
MC14081B, MC14082B

The B 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.

### 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 Except: Triple Diode Protection on MC14011B and MC14081B
- Pin-for-Pin Replacements for Corresponding CD4000 Series B Suffix Devices
- 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                                  | $\pm 10$               | 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   |
| $V_{ESD}$            | ESD Withstand Voltage<br>Human Body Model<br>Machine Model<br>Charged Device Model | > 3000<br>> 300<br>N/A | V    |

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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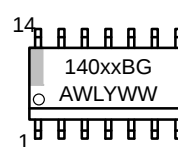


SOIC-14  
D SUFFIX  
CASE 751A

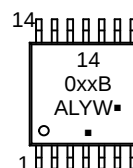


TSSOP-14  
DT SUFFIX  
CASE 948G

### MARKING DIAGRAMS



SOIC-14



TSSOP-14

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

(Note: Microdot may be in either location)

### DEVICE INFORMATION

| Device   | Description              |
|----------|--------------------------|
| MC14001B | Quad 2-Input NOR Gate    |
| MC14011B | Quad 2-Input NAND Gate   |
| MC14023B | Triple 3-Input NAND Gate |
| MC14025B | Triple 3-Input NOR Gate  |
| MC14071B | Quad 2-Input OR Gate     |
| MC14073B | Triple 3-Input AND Gate  |
| MC14081B | Quad 2-Input AND Gate    |
| MC14082B | Dual 4-Input AND Gate    |

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

# MC14001B Series

## LOGIC DIAGRAMS



## PIN ASSIGNMENTS



# MC14001B Series

## ELECTRICAL CHARACTERISTICS (Voltages Referenced to V<sub>SS</sub>)

| Characteristic                                                                                                                                    | Symbol                       | V <sub>DD</sub><br>Vdc | - 55°C                                                                                                                                                               |      | 25°C  |                 |      | 125°C |      | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|-----------------|------|-------|------|------|
|                                                                                                                                                   |                              |                        | Min                                                                                                                                                                  | Max  | Min   | Typ<br>(Note 2) | Max  | Min   | Max  |      |
| Output Voltage<br>V <sub>in</sub> = V <sub>DD</sub> or 0                                                                                          | “0” Level<br>V <sub>OL</sub> | 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 |      |
|                                                                                                                                                   | “1” Level<br>V <sub>OH</sub> | 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<br>(V <sub>O</sub> = 4.5 or 0.5 Vdc)<br>(V <sub>O</sub> = 9.0 or 1.0 Vdc)<br>(V <sub>O</sub> = 13.5 or 1.5 Vdc)                     | “0” Level<br>V <sub>IL</sub> | 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  |      |
|                                                                                                                                                   | “1” Level<br>V <sub>IH</sub> | 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<br>(V <sub>OH</sub> = 2.5 Vdc)<br>(V <sub>OH</sub> = 4.6 Vdc)<br>(V <sub>OH</sub> = 9.5 Vdc)<br>(V <sub>OH</sub> = 13.5 Vdc) | Source<br>I <sub>OH</sub>    | 5.0                    | –3.0                                                                                                                                                                 | –    | –2.4  | –4.2            | –    | –1.7  | –    | mAdc |
|                                                                                                                                                   |                              | 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  | –    |      |
|                                                                                                                                                   | Sink<br>I <sub>OL</sub>      | 5.0                    | 0.64                                                                                                                                                                 | –    | 0.51  | 0.88            | –    | 0.36  | –    | mAdc |
|                                                                                                                                                   |                              | 10                     | 1.6                                                                                                                                                                  | –    | 1.3   | 2.25            | –    | 0.9   | –    |      |
|                                                                                                                                                   |                              | 15                     | 4.2                                                                                                                                                                  | –    | 3.4   | 8.8             | –    | 2.4   | –    |      |
| Input Current                                                                                                                                     | I <sub>in</sub>              | 15                     | –                                                                                                                                                                    | ±0.1 | –     | ±0.00001        | ±0.1 | –     | ±1.0 | μAdc |
| Input Capacitance<br>(V <sub>in</sub> = 0)                                                                                                        | C <sub>in</sub>              | –                      | –                                                                                                                                                                    | –    | –     | 5.0             | 7.5  | –     | –    | pF   |
| Quiescent Current<br>(Per Package)                                                                                                                | I <sub>DD</sub>              | 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   |      |
| Total Supply Current (Notes 3, 4)<br>(Dynamic plus Quiescent,<br>Per Gate, C <sub>L</sub> = 50 pF)                                                | I <sub>T</sub>               | 5.0<br>10<br>15        | I <sub>T</sub> = (0.3 μA/kHz) f + I <sub>DD</sub> /N<br>I <sub>T</sub> = (0.6 μA/kHz) f + I <sub>DD</sub> /N<br>I <sub>T</sub> = (0.9 μA/kHz) f + I <sub>DD</sub> /N |      |       |                 |      |       |      | μAdc |

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:

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

where: I<sub>T</sub> is in μA (per package), C<sub>L</sub> in pF, V = (V<sub>DD</sub> – V<sub>SS</sub>) in volts, f in kHz is input frequency, and k = 0.001 x the number of exercised gates per package.

# MC14001B Series

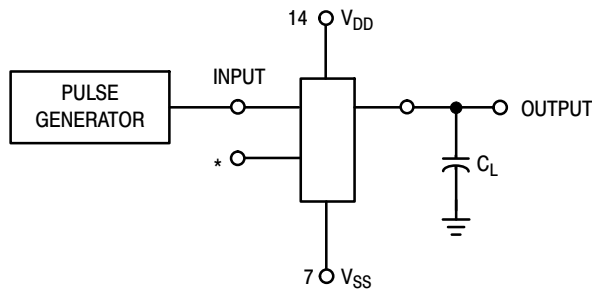
## B-SERIES GATE SWITCHING TIMES

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

| Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Symbol             | $V_{DD}$<br>Vdc                                               | Min                                               | Typ<br>(Note 6)                                               | Max                                                                | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------|------|
| Output Rise Time, All B-Series Gates<br>$t_{TLH} = (1.35 \text{ ns/pF}) C_L + 33 \text{ ns}$<br>$t_{TLH} = (0.60 \text{ ns/pF}) C_L + 20 \text{ ns}$<br>$t_{TLH} = (0.40 \text{ ns/pF}) C_L + 20 \text{ ns}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $t_{TLH}$          | 5.0<br>10<br>15                                               | —<br>—<br>—                                       | 100<br>50<br>40                                               | 200<br>100<br>80                                                   | ns   |
| Output Fall Time, All B-Series Gates<br>$t_{THL} = (1.35 \text{ ns/pF}) C_L + 33 \text{ ns}$<br>$t_{THL} = (0.60 \text{ ns/pF}) C_L + 20 \text{ ns}$<br>$t_{THL} = (0.40 \text{ ns/pF}) C_L + 20 \text{ ns}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $t_{THL}$          | 5.0<br>10<br>15                                               | —<br>—<br>—                                       | 100<br>50<br>40                                               | 200<br>100<br>80                                                   | ns   |
| Propagation Delay Time<br>MC14001B, MC14011B only<br>$t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 80 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 32 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 27 \text{ ns}$<br>All Other 2, 3, and 4 Input Gates<br>$t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 115 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 47 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 37 \text{ ns}$<br>8-Input Gates (MC14068B, MC14078B)<br>$t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 155 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 62 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 47 \text{ ns}$ | $t_{PLH}, t_{PHL}$ | 5.0<br>10<br>15<br><br>5.0<br>10<br>15<br><br>5.0<br>10<br>15 | —<br>—<br>—<br><br>—<br>—<br>—<br><br>—<br>—<br>— | 125<br>50<br>40<br><br>160<br>65<br>50<br><br>200<br>80<br>60 | 250<br>100<br>80<br><br>300<br>130<br>100<br><br>350<br>150<br>110 | ns   |

5. The formulas given are for the typical characteristics only at  $25^\circ\text{C}$ .

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



\*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**

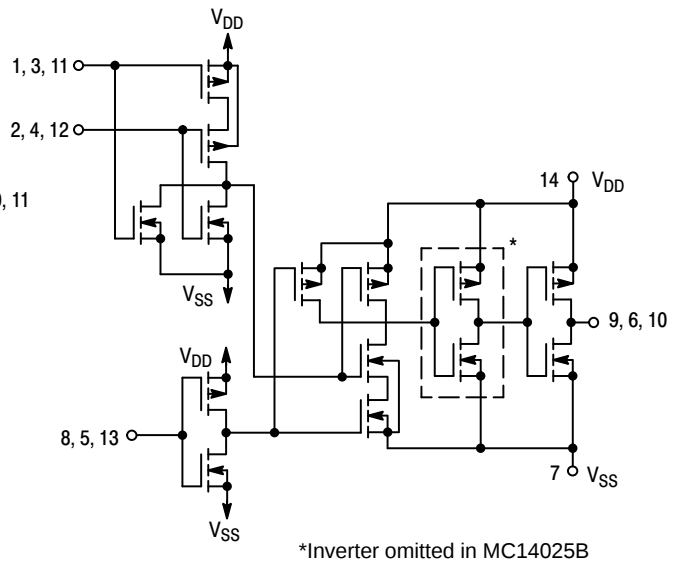
## MC14001B Series

### CIRCUIT SCHEMATIC NOR, OR GATES

**MC14001B, MC14071B**  
One of Four Gates Shown

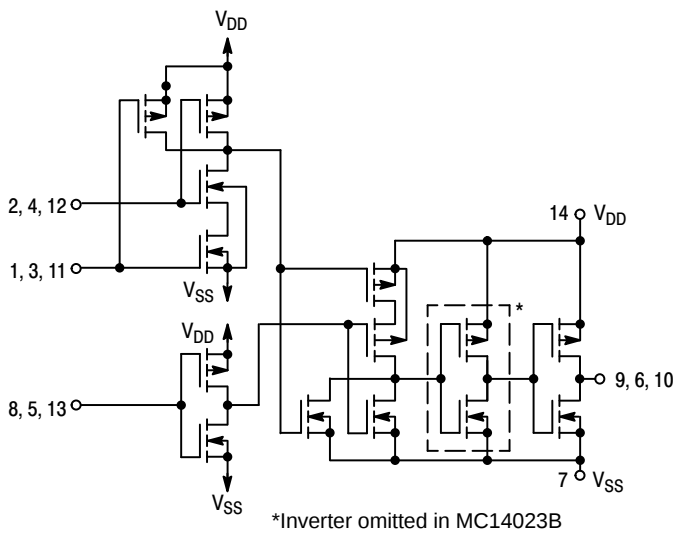


**MC14025B**  
One of Three Gates Shown

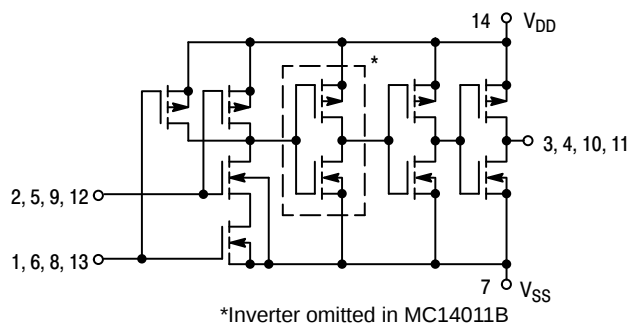


### CIRCUIT SCHEMATIC NAND, AND GATES

**MC14023B, MC14073B**  
One of Three Gates Shown



**MC14011B, MC14081B**  
One of Four Gates Shown



TYPICAL B-SERIES GATE CHARACTERISTICS

N-CHANNEL DRAIN CURRENT (SINK)

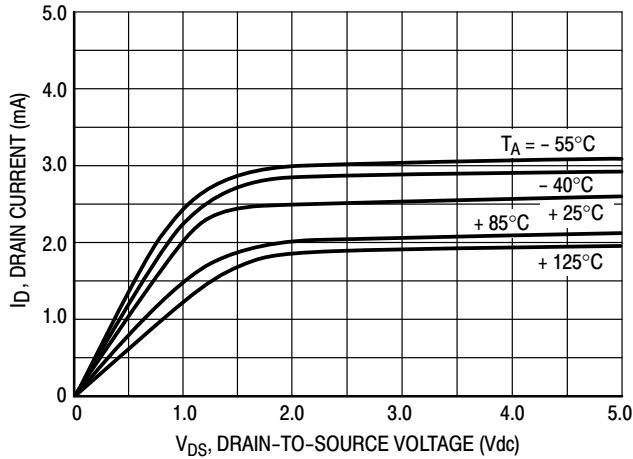


Figure 2.  $V_{GS} = 5.0$  Vdc

P-CHANNEL DRAIN CURRENT (SOURCE)

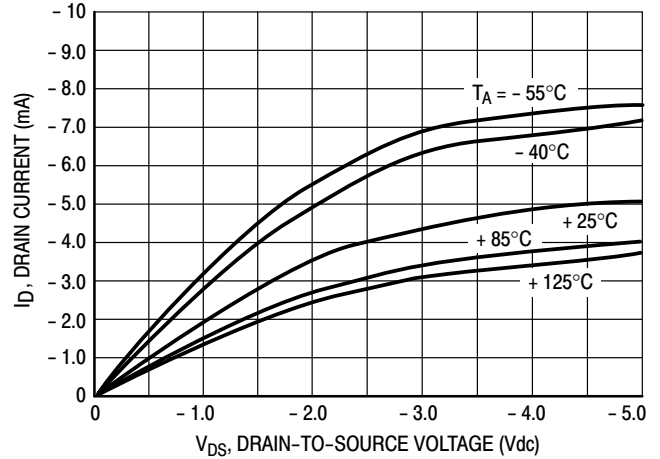


Figure 3.  $V_{GS} = -5.0$  Vdc

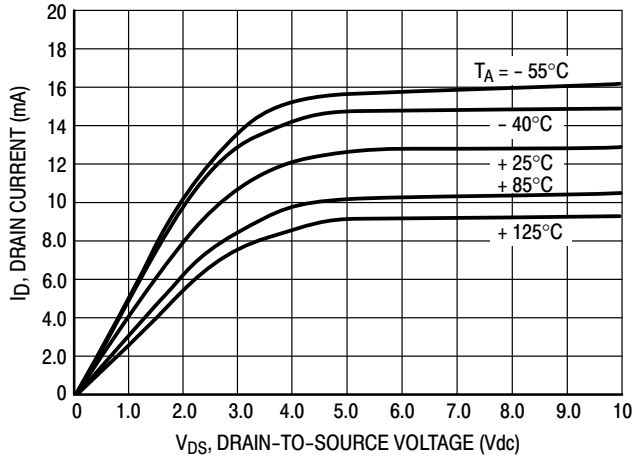


Figure 4.  $V_{GS} = 10$  Vdc

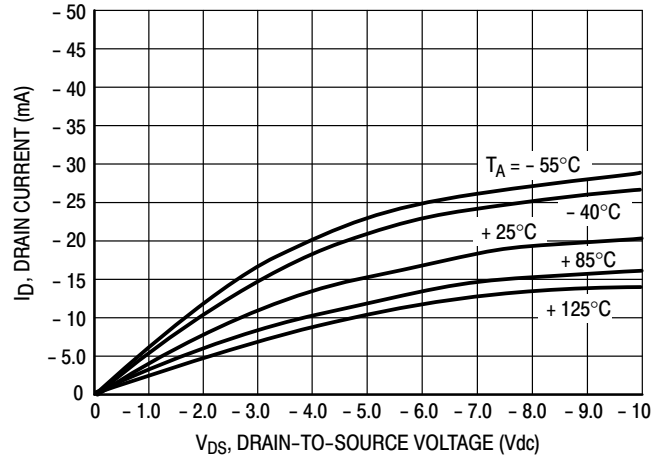


Figure 5.  $V_{GS} = -10$  Vdc

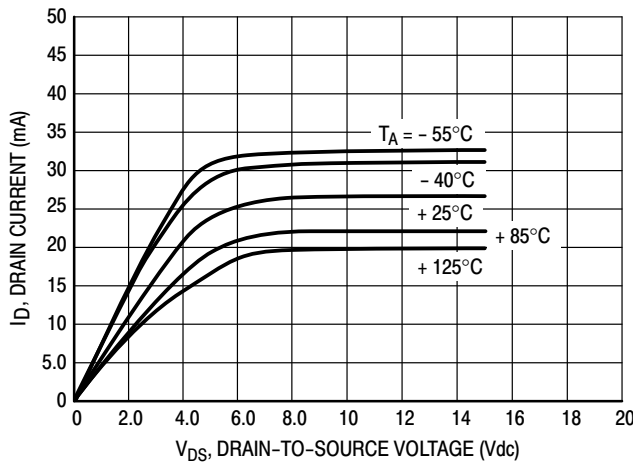


Figure 6.  $V_{GS} = 15$  Vdc

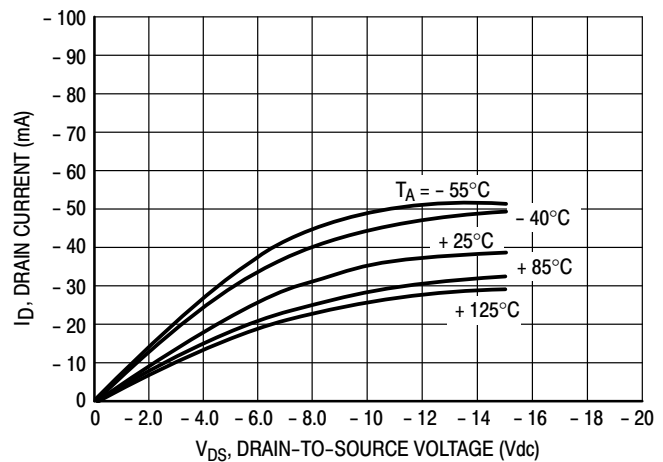


Figure 7.  $V_{GS} = -15$  Vdc

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

TYPICAL B-SERIES GATE CHARACTERISTICS (cont'd)

VOLTAGE TRANSFER CHARACTERISTICS



Figure 8.  $V_{DD} = 5.0$  Vdc



Figure 9.  $V_{DD} = 10$  Vdc



Figure 10.  $V_{DD} = 15$  Vdc

DC NOISE MARGIN

The DC noise margin is defined as the input voltage range from an ideal “1” or “0” input level which does not produce output state change(s). The typical and guaranteed limit values of the input values  $V_{IL}$  and  $V_{IH}$  for the output(s) to be at a fixed voltage  $V_O$  are given in the Electrical Characteristics table.  $V_{IL}$  and  $V_{IH}$  are presented graphically in Figure 11.

Guaranteed minimum noise margins for both the “1” and “0” levels =

1.0 V with a 5.0 V supply

2.0 V with a 10.0 V supply

2.5 V with a 15.0 V supply



(a) Inverting Function



(b) Non-Inverting Function

$V_{SS} = 0$  VOLTS DC

Figure 11. DC Noise Immunity

## MC14001B Series

### ORDERING INFORMATION

| Device          | Package                | Shipping <sup>†</sup>    |
|-----------------|------------------------|--------------------------|
| MC14001BDG      | SOIC-14<br>(Pb-Free)   | 55 Units / Rail          |
| NLV14001BDG*    |                        |                          |
| MC14001BDR2G    | SOIC-14<br>(Pb-Free)   | 2500 Units / Tape & Reel |
| NLV14001BDR2G*  |                        |                          |
| MC14001BDTR2G   | TSSOP-14<br>(Pb-Free)  |                          |
| NLV14001BDTR2G* |                        |                          |
| MC14001BFELG    | SOEIAJ-14<br>(Pb-Free) | 2000 Units / Tape & Reel |

|                 |                        |                          |
|-----------------|------------------------|--------------------------|
| MC14011BDG      | SOIC-14<br>(Pb-Free)   | 55 Units / Rail          |
| NLV14011BDG*    |                        |                          |
| MC14011BDR2G    | SOIC-14<br>(Pb-Free)   | 2500 Units / Tape & Reel |
| NLV14011BDR2G*  |                        |                          |
| MC14011BDTR2G   | TSSOP-14<br>(Pb-Free)  |                          |
| NLV14011BDTR2G* |                        |                          |
| MC14011BFG      | SOEIAJ-14<br>(Pb-Free) | 50 Units / Rail          |
| MC14011BFELG    |                        | 2000 Units / Tape & Reel |

|                |                        |                          |
|----------------|------------------------|--------------------------|
| MC14023BDG     | SOIC-14<br>(Pb-Free)   | 55 Units / Rail          |
| MC14023BDR2G   | SOIC-14<br>(Pb-Free)   | 2500 Units / Tape & Reel |
| NLV14023BDR2G* |                        |                          |
| MC14023BFELG   | SOEIAJ-14<br>(Pb-Free) | 2000 Units / Tape & Reel |

|                |                      |                          |
|----------------|----------------------|--------------------------|
| MC14025BDG     | SOIC-14<br>(Pb-Free) | 55 Units / Rail          |
| NLV14025BDG*   |                      |                          |
| MC14025BDR2G   | SOIC-14<br>(Pb-Free) | 2500 Units / Tape & Reel |
| NLV14025BDR2G* |                      |                          |

|                 |                       |                          |
|-----------------|-----------------------|--------------------------|
| MC14071BDG      | SOIC-14<br>(Pb-Free)  | 55 Units / Rail          |
| NLV14071BDG*    |                       |                          |
| MC14071BDR2G    | SOIC-14<br>(Pb-Free)  | 2500 Units / Tape & Reel |
| NLV14071BDR2G*  |                       |                          |
| MC14071BDTG     | TSSOP-14<br>(Pb-Free) | 96 Units per Rail        |
| MC14071BDTR2G   |                       | 2500 Units / Tape & Reel |
| NLV14071BDTR2G* |                       |                          |

|              |                      |                          |
|--------------|----------------------|--------------------------|
| MC14073BDG   | SOIC-14<br>(Pb-Free) | 55 Units / Rail          |
| MC14073BDR2G | SOIC-14<br>(Pb-Free) | 2500 Units / Tape & Reel |

## MC14001B Series

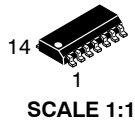
### ORDERING INFORMATION (continued)

| Device          | Package               | Shipping <sup>†</sup>    |
|-----------------|-----------------------|--------------------------|
| MC14081BDG      | SOIC-14<br>(Pb-Free)  | 55 Units / Rail          |
| NLV14081BDG*    |                       |                          |
| MC14081BDR2G    | SOIC-14<br>(Pb-Free)  | 2500 Units / Tape & Reel |
| NLV14081BDR2G*  |                       |                          |
| MC14081BDTR2G   | TSSOP-14<br>(Pb-Free) |                          |
| NLV14081BDTR2G* |                       |                          |

|              |                      |                          |
|--------------|----------------------|--------------------------|
| MC14082BDG   | SOIC-14<br>(Pb-Free) | 55 Units / Rail          |
| NLV14082BDG* |                      |                          |
| MC14082BDR2G |                      | 2500 Units / Tape & Reel |

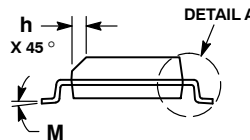
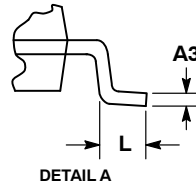
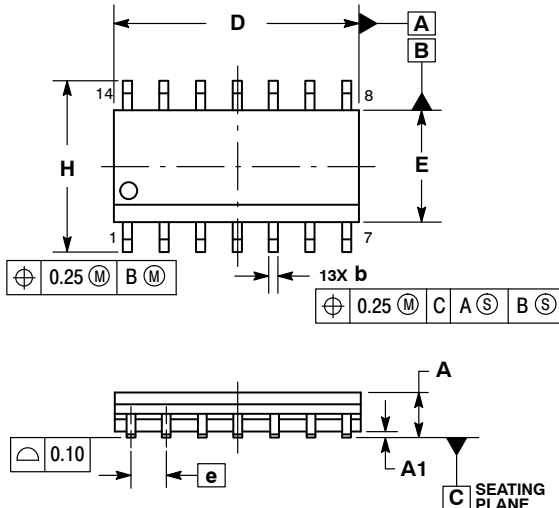
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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



SOIC-14 NB  
CASE 751A-03  
ISSUE L

DATE 03 FEB 2016

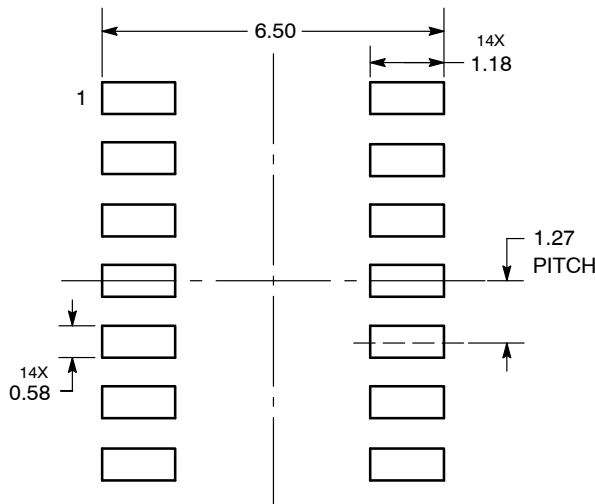


NOTES:

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°    |

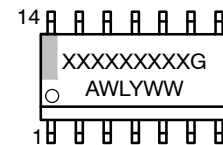
SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** 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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