

# CD54/74HC4051, CD54/74HCT4051, CD54/74HC4052, CD74HCT4052, CD54/74HC4053, CD74HCT4053

## High-Speed CMOS Logic Analog Multiplexers/Demultiplexers

November 1997 - Revised July 2004

### Features

- Wide Analog Input Voltage Range . . . . .  $\pm 5V$  Max
- Low "On" Resistance
  - 70 $\Omega$  Typical ( $V_{CC} - V_{EE} = 4.5V$ )
  - 40 $\Omega$  Typical ( $V_{CC} - V_{EE} = 9V$ )
- Low Crosstalk between Switches
- Fast Switching and Propagation Speeds
- "Break-Before-Make" Switching
- Wide Operating Temperature Range . . -55 $^{\circ}C$  to 125 $^{\circ}C$
- CD54HC/CD74HC Types
  - Operation Control Voltage . . . . . 2V to 6V
  - Switch Voltage . . . . . 0V to 10V
  - High Noise Immunity . . .  $N_{IL} = 30\%$ ,  $N_{IH} = 30\%$  of  $V_{CC}$ ,  $V_{CC} = 5V$
- CD54HCT/CD74HCT Types
  - Operation Control Voltage . . . . . 4.5V to 5.5V
  - Switch Voltage . . . . . 0V to 10V
  - Direct LSTTL Input  
Logic Compatibility . . .  $V_{IL} = 0.8V$  Max,  $V_{IH} = 2V$  Min
  - CMOS Input Compatibility . . . . .  $I_I \leq 1\mu A$  at  $V_{OL}$ ,  $V_{OH}$

### Description

These devices are digitally controlled analog switches which utilize silicon gate CMOS technology to achieve operating speeds similar to LSTTL with the low power consumption of standard CMOS integrated circuits.

These analog multiplexers/demultiplexers control analog voltages that may vary across the voltage supply range (i.e.  $V_{CC}$  to  $V_{EE}$ ). They are bidirectional switches thus allowing any analog input to be used as an output and vice-versa. The switches have low "on" resistance and low "off" leakages. In addition, all three devices have an enable control which, when high, disables all switches to their "off" state.

### Ordering Information

| PART NUMBER    | TEMP. RANGE<br>( $^{\circ}C$ ) | PACKAGE      |
|----------------|--------------------------------|--------------|
| CD54HC4051F3A  | -55 to 125                     | 16 Ld CERDIP |
| CD54HC4052F3A  | -55 to 125                     | 16 Ld CERDIP |
| CD54HC4053F3A  | -55 to 125                     | 16 Ld CERDIP |
| CD54HCT4051F3A | -55 to 125                     | 16 Ld CERDIP |

### Ordering Information

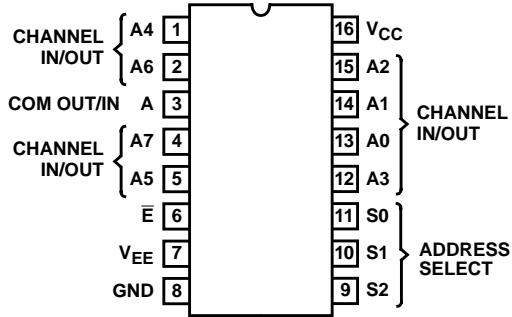
| PART NUMBER    | TEMP. RANGE<br>( $^{\circ}C$ ) | PACKAGE     |
|----------------|--------------------------------|-------------|
| CD74HC4051E    | -55 to 125                     | 16 Ld PDIP  |
| CD74HC4051M    | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4051MT   | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4051M96  | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4051NSR  | -55 to 125                     | 16 Ld SOP   |
| CD74HC4051PWR  | -55 to 125                     | 16 Ld TSSOP |
| CD74HC4051PWT  | -55 to 125                     | 16 Ld TSSOP |
| CD74HC4052E    | -55 to 125                     | 16 Ld PDIP  |
| CD74HC4052M    | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4052MT   | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4052M96  | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4052NSR  | -55 to 125                     | 16 Ld SOP   |
| CD74HC4052PWR  | -55 to 125                     | 16 Ld TSSOP |
| CD74HC4052PWT  | -55 to 125                     | 16 Ld TSSOP |
| CD74HC4053E    | -55 to 125                     | 16 Ld PDIP  |
| CD74HC4053M    | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4053MT   | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4053M96  | -55 to 125                     | 16 Ld SOIC  |
| CD74HC4053NSR  | -55 to 125                     | 16 Ld SOP   |
| CD74HC4053PW   | -55 to 125                     | 16 Ld TSSOP |
| CD74HC4053PWR  | -55 to 125                     | 16 Ld TSSOP |
| CD74HC4053PWT  | -55 to 125                     | 16 Ld TSSOP |
| CD74HCT4051E   | -55 to 125                     | 16 Ld PDIP  |
| CD74HCT4051M   | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4051MT  | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4051M96 | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4052E   | -55 to 125                     | 16 Ld PDIP  |
| CD74HCT4052M   | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4052MT  | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4052M96 | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4053E   | -55 to 125                     | 16 Ld PDIP  |
| CD74HCT4053M   | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4053MT  | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4053M96 | -55 to 125                     | 16 Ld SOIC  |
| CD74HCT4053PWR | -55 to 125                     | 16 Ld TSSOP |
| CD74HCT4053PWT | -55 to 125                     | 16 Ld TSSOP |

NOTE: When ordering, use the entire part number. The suffixes 96 and R denote tape and reel. The suffix T denotes a small-quantity reel of 250.

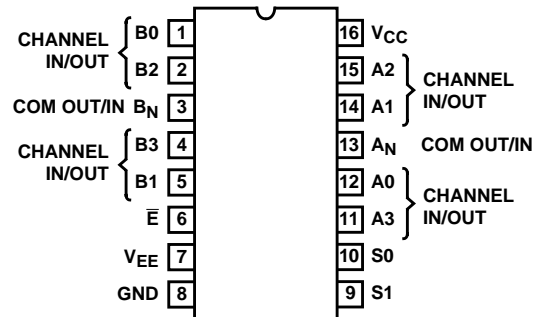
'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053

Pinouts

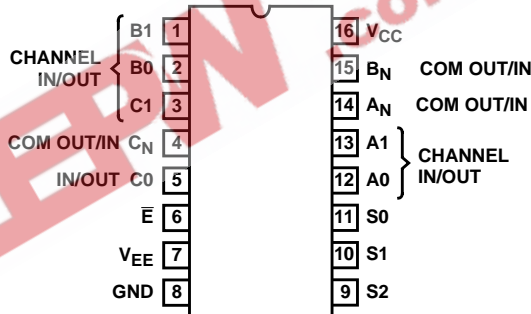
CD54HC4051, CD54HCT4051  
(CERDIP)  
CD74HC4051  
(PDIP, SOIC, SOP, TSSOP)  
CD74HCT4051  
(PDIP, SOIC)  
TOP VIEW



CD54HC4052  
(CERDIP)  
CD74HC4052  
(PDIP, SOIC, SOP, TSSOP)  
CD74HCT4052  
(PDIP, SOIC)  
TOP VIEW

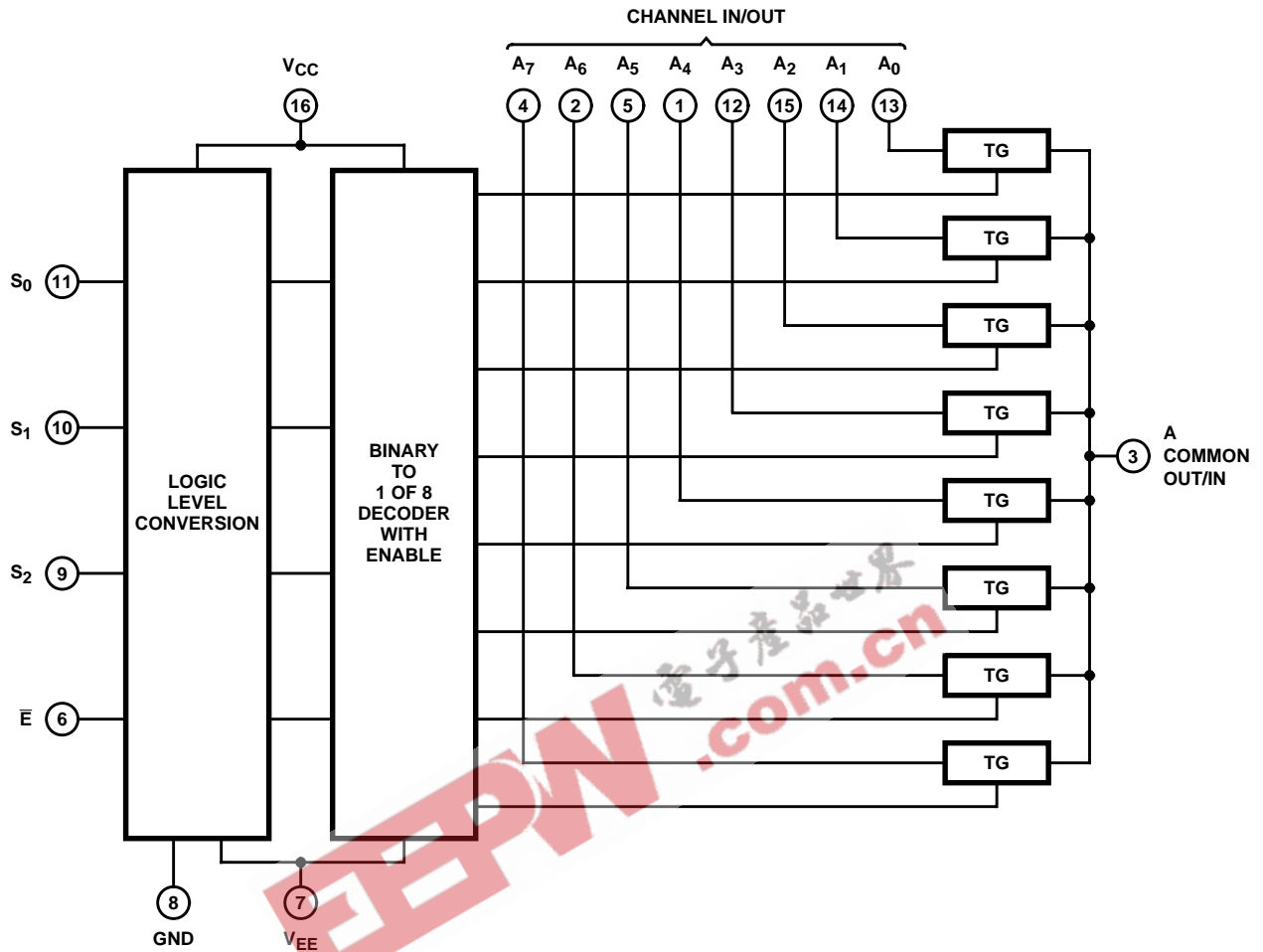


CD54HC4053  
(CERDIP)  
CD74HC4053  
(PDIP, SOIC, SOP, TSSOP)  
CD74HCT4053  
(PDIP, SOIC, TSSOP)  
TOP VIEW



'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053

Functional Diagram of HC/HCT4051



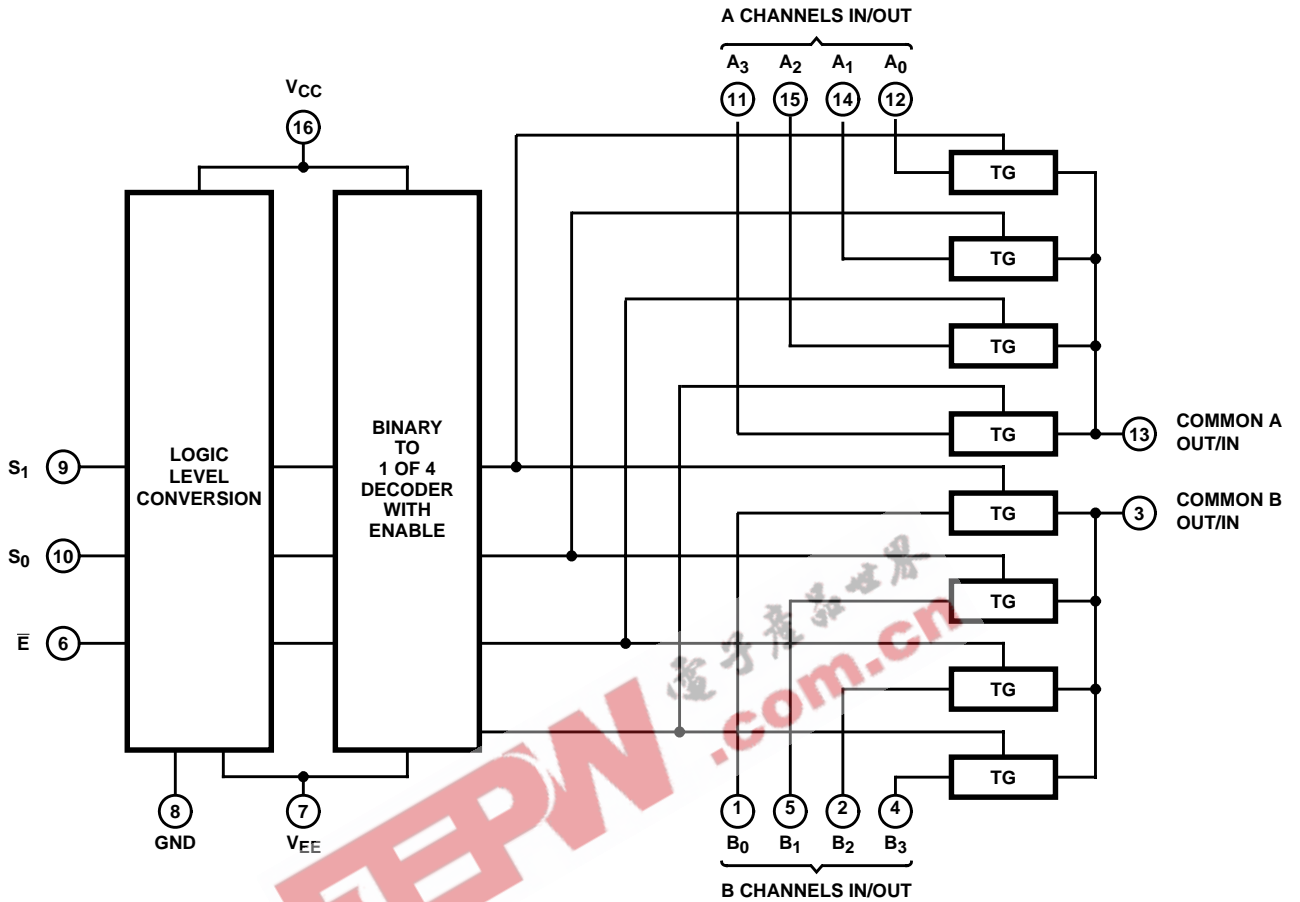
TRUTH TABLE  
HC/HCT4051

| INPUT STATES |                |                |                | "ON" CHANNELS |
|--------------|----------------|----------------|----------------|---------------|
| ENABLE       | S <sub>2</sub> | S <sub>1</sub> | S <sub>0</sub> |               |
| L            | L              | L              | L              | A0            |
| L            | L              | L              | H              | A1            |
| L            | L              | H              | L              | A2            |
| L            | L              | H              | H              | A3            |
| L            | H              | L              | L              | A4            |
| L            | H              | L              | H              | A5            |
| L            | H              | H              | L              | A6            |
| L            | H              | H              | H              | A7            |
| H            | X              | X              | X              | None          |

X = Don't care

'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053

Functional Diagram of 'HC4052, CD74HCT4052



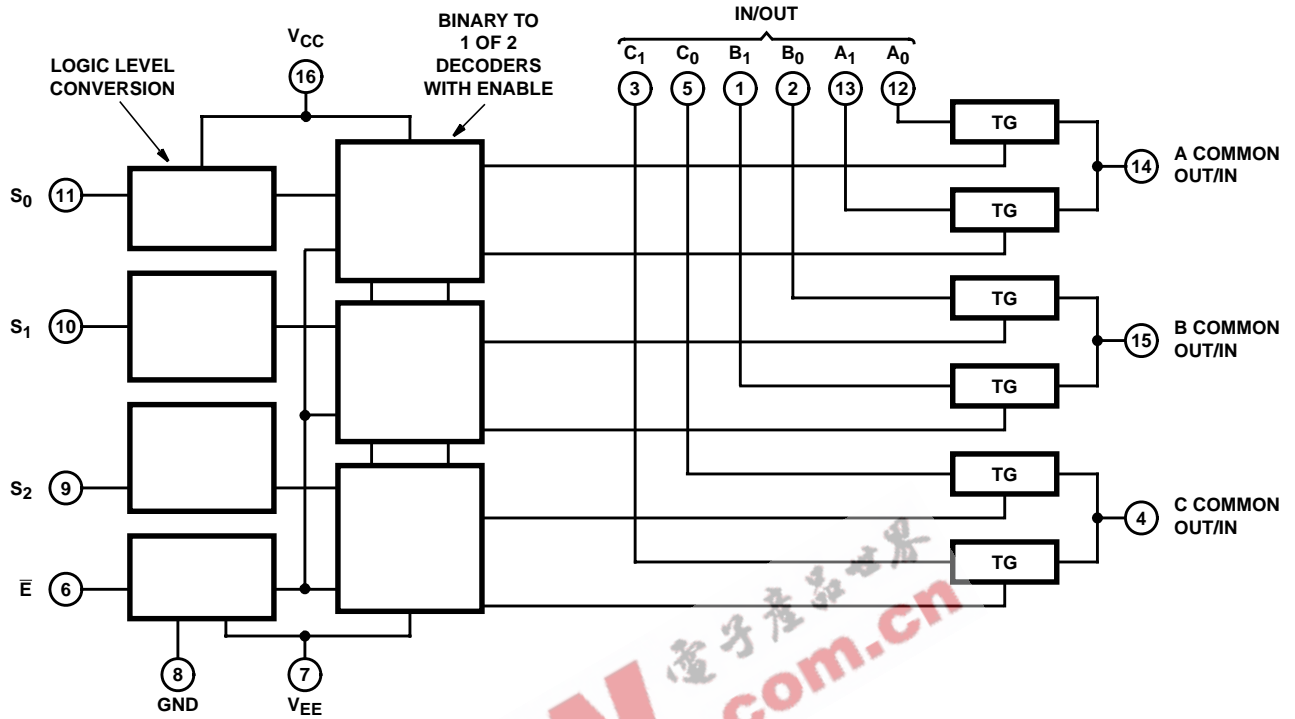
TRUTH TABLE  
'HC4052, CD74HCT4052

| INPUT STATES |                |                | "ON" CHANNELS |
|--------------|----------------|----------------|---------------|
| ENABLE       | S <sub>1</sub> | S <sub>0</sub> |               |
| L            | L              | L              | A0, B0        |
| L            | L              | H              | A1, B1        |
| L            | H              | L              | A2, B2        |
| L            | H              | H              | A3, B3        |
| H            | X              | X              | None          |

X = Don't care

'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053

Functional Diagram of 'HC4053, CD74HCT4053



TRUTH TABLE  
'HC4053, CD74HCT4053

| INPUT STATES |       |       |       | "ON" CHANNELS   |
|--------------|-------|-------|-------|-----------------|
| ENABLE       | $S_0$ | $S_1$ | $S_2$ |                 |
| L            | L     | L     | L     | $C_0, B_0, A_0$ |
| L            | H     | L     | L     | $C_0, B_0, A_1$ |
| L            | L     | H     | L     | $C_0, B_1, A_0$ |
| L            | H     | H     | L     | $C_0, B_1, A_1$ |
| L            | L     | L     | H     | $C_1, B_0, A_0$ |
| L            | H     | L     | H     | $C_1, B_0, A_1$ |
| L            | L     | H     | H     | $C_1, B_1, A_0$ |
| L            | H     | H     | H     | $C_1, B_1, A_1$ |
| H            | X     | X     | X     | None            |

X = Don't care

## 'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053

### Absolute Maximum Ratings (Note 2)

|  |                |
|--|----------------|
| DC Supply Voltage, $V_{CC} - V_{EE}$               | -0.5V to 10.5V |
| DC Supply Voltage, $V_{CC}$                        | -0.5V to +7V   |
| DC Supply Voltage, $V_{EE}$                        | +0.5V to -7V   |
| DC Input Diode Current, $I_{IK}$                   |                |
| For $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$         | $\pm 20mA$     |
| DC Switch Diode Current, $I_{OK}$                  |                |
| For $V_I < V_{EE} - 0.5V$ or $V_I > V_{CC} + 0.5V$ | $\pm 20mA$     |
| DC Switch Current, (Note 2)                        |                |
| For $V_I > V_{EE} - 0.5V$ or $V_I < V_{CC} + 0.5V$ | $\pm 25mA$     |
| DC $V_{CC}$ or Ground Current, $I_{CC}$            | $\pm 50mA$     |
| DC $V_{EE}$ Current, $I_{EE}$                      | -20mA          |

#### NOTE:

- The package thermal impedance is calculated in accordance with JESD 51-7.

### Recommended Operating Conditions

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges

| PARAMETER  | MIN      | MAX      | UNITS       |
|--|----------|----------|-------------|
| Supply Voltage Range (For $T_A$ = Full Package Temperature Range), $V_{CC}$ (Note 2) |          |          |             |
| CD54/74HC Types  | 2        | 6        | V           |
| CD54/74HCT Types   | 4.5      | 5.5      | V           |
| Supply Voltage Range (For $T_A$ = Full Package Temperature Range), $V_{CC} - V_{EE}$ |          |          |             |
| CD54/74HC Types, CD54/74HCT Types (See Figure 1)                                     | 2        | 10       | V           |
| Supply Voltage Range (For $T_A$ = Full Package Temperature Range), $V_{EE}$ (Note 3) |          |          |             |
| CD54/74HC Types, CD54/74HCT Types (See Figure 2)                                     | 0        | -6       | V           |
| DC Input Control Voltage, $V_I$  | GND      | $V_{CC}$ | V           |
| Analog Switch I/O Voltage, $V_{IS}$  | $V_{EE}$ | $V_{CC}$ | V           |
| Operating Temperature, $T_A$   | -55      | 125      | $^{\circ}C$ |
| Input Rise and Fall Times, $t_r, t_f$  |          |          |             |
| 2V   | 0        | 1000     | ns          |
| 4.5V   | 0        | 500      | ns          |
| 6V   | 0        | 400      | ns          |

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

#### NOTES:

- All voltages referenced to GND unless otherwise specified.
- In certain applications, the external load resistor current may include both  $V_{CC}$  and signal line components. To avoid drawing  $V_{CC}$  current when switch current flows into the transmission gate inputs, the voltage drop across the bidirectional switch must not exceed 0.6V (calculated from  $r_{ON}$  values shown in Electrical Specifications table). No  $V_{CC}$  current will flow through  $R_L$  if the switch current flows into terminal 3 on the HC/HCT4051; terminals 3 and 13 on the HC/HCT4052; terminals 4, 14 and 15 on the HC/HCT4053.

### Recommended Operating Area as a Function of Supply Voltages

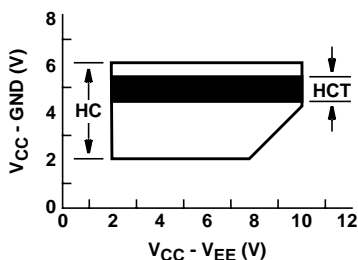


FIGURE 1.

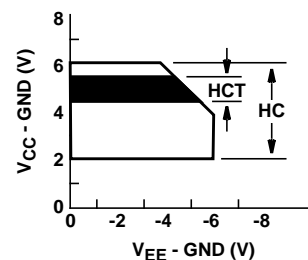


FIGURE 2.

**'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053**

**DC Electrical Specifications**

| PARAMETER   | TEST CONDITIONS   |                                    |                        |                        | AMBIENT TEMPERATURE, T <sub>A</sub> |      |      |              |      |               | UNITS |     |
|---|---|------------------------------------|------------------------|------------------------|-------------------------------------|------|------|--------------|------|---------------|-------|-----|
|   | V <sub>IS</sub><br>(V)  | V <sub>I</sub><br>(V)              | V <sub>EE</sub><br>(V) | V <sub>CC</sub><br>(V) | 25°C                                |      |      | -40°C - 85°C |      | -55°C - 125°C |       |     |
|   |   |                                    |                        |                        | MIN                                 | TYP  | MAX  | MIN          | MAX  | MIN           |       | MAX |
| <b>HC TYPES</b>   |   |                                    |                        |                        |                                     |      |      |              |      |               |       |     |
| High Level Input Voltage, V <sub>IH</sub>                           |   |                                    |                        | 2                      | 1.5                                 | -    | -    | 1.5          | -    | 1.5           | -     | V   |
|   |   |                                    |                        | 4.5                    | 3.15                                | -    | -    | 3.15         | -    | 3.15          | 0     | V   |
|   |   |                                    |                        | 6                      | 4.2                                 | -    | -    | 4.2          | -    | 4.2           | -     | V   |
| Low Level Input Voltage, V <sub>IL</sub>                            |   |                                    |                        | 2                      | -                                   | -    | 0.5  | -            | 0.5  | -             | 0.5   | V   |
|   |   |                                    |                        | 4.5                    | -                                   | -    | 1.35 | -            | 1.35 | -             | 1.35  | V   |
|   |   |                                    |                        | 6                      | -                                   | -    | 1.8  | -            | 1.8  | -             | 1.8   | V   |
| On Resistance, r <sub>ON</sub><br>I <sub>O</sub> = 1mA, (Figure 11) | V <sub>CC</sub> or V <sub>EE</sub>  | V <sub>IL</sub> or V <sub>IH</sub> | 0                      | 4.5                    | -                                   | 70   | 160  | -            | 200  | -             | 240   | Ω   |
|   |   |                                    | 0                      | 6                      | -                                   | 60   | 140  | -            | 175  | -             | 210   | Ω   |
|   |   |                                    | -4.5                   | 4.5                    | -                                   | 40   | 120  | -            | 150  | -             | 180   | Ω   |
|   | V <sub>CC</sub> to V <sub>EE</sub>  |                                    | 0                      | 4.5                    | -                                   | 90   | 180  | -            | 225  | -             | 270   | Ω   |
|   |   |                                    | 0                      | 6                      | -                                   | 80   | 160  | -            | 200  | -             | 240   | Ω   |
|   |   |                                    | -4.5                   | 4.5                    | -                                   | 45   | 130  | -            | 162  | -             | 195   | Ω   |
| Maximum On Resistance Between any Two Channels, Δr <sub>ON</sub>    |   |                                    | 0                      | 4.5                    | -                                   | 10   | -    | -            | -    | -             | Ω     |     |
|   |   |                                    | 0                      | 6                      | -                                   | 8.5  | -    | -            | -    | -             | Ω     |     |
|   |   |                                    | -4.5                   | 4.5                    | -                                   | 5    | -    | -            | -    | -             | Ω     |     |
| Switch On/Off Leakage Current, I <sub>IZ</sub>                      | For Switch Off:<br>When V <sub>IS</sub> = V <sub>CC</sub> ,<br>V <sub>OS</sub> = V <sub>EE</sub> ;<br>When V <sub>IS</sub> = V <sub>EE</sub> ,<br>V <sub>OS</sub> = V <sub>CC</sub> | V <sub>IL</sub> or V <sub>IH</sub> |                        |                        |                                     |      |      |              |      |               |       |     |
| 1 and 2 Channels  |   |                                    | 0                      | 6                      | -                                   | -    | ±0.1 | -            | ±1   | -             | ±1    | μA  |
| 4053  |   |                                    | -5                     | 5                      | -                                   | -    | ±0.1 | -            | ±1   | -             | ±1    | μA  |
| 4 Channels  | For Switch On:<br>All Applicable  |                                    | 0                      | 6                      | -                                   | -    | ±0.1 | -            | ±1   | -             | ±1    | μA  |
| 4052  | Combinations of V <sub>IS</sub> and V <sub>OS</sub> Voltage Levels  |                                    | -5                     | 5                      | -                                   | -    | ±0.2 | -            | ±2   | -             | ±2    | μA  |
| 8 Channels  |   |                                    | 0                      | 6                      | -                                   | -    | ±0.2 | -            | ±2   | -             | ±2    | μA  |
| 4051  |   | -5                                 | 5                      | -                      | -                                   | ±0.4 | -    | ±4           | -    | ±4            | μA    |     |
| Control Input Leakage Current, I <sub>IL</sub>                      |   | V <sub>CC</sub> or GND             | 0                      | 6                      | -                                   | -    | ±0.1 | -            | ±1   | -             | ±1    | μA  |
| Quiescent Device Current, I <sub>CC</sub><br>I <sub>O</sub> = 0     | When V <sub>IS</sub> = V <sub>EE</sub> ,<br>V <sub>OS</sub> = V <sub>CC</sub>   | V <sub>CC</sub> or GND             | 0                      | 6                      | -                                   | -    | 8    | -            | 80   | -             | 160   | μA  |
|   | When V <sub>IS</sub> = V <sub>CC</sub> ,<br>V <sub>OS</sub> = V <sub>EE</sub>   |                                    | -5                     | 5                      | -                                   | -    | 16   | -            | 160  | -             | 320   | μA  |

**'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053**

**DC Electrical Specifications (Continued)**

| PARAMETER   | TEST CONDITIONS   |                                    |                        |                        | AMBIENT TEMPERATURE, T <sub>A</sub> |     |      |              |     |               | UNITS |     |    |
|---|---|------------------------------------|------------------------|------------------------|-------------------------------------|-----|------|--------------|-----|---------------|-------|-----|----|
|   | V <sub>IS</sub><br>(V)  | V <sub>I</sub><br>(V)              | V <sub>EE</sub><br>(V) | V <sub>CC</sub><br>(V) | 25°C                                |     |      | -40°C - 85°C |     | -55°C - 125°C |       |     |    |
|   |   |                                    |                        |                        | MIN                                 | TYP | MAX  | MIN          | MAX | MIN           |       | MAX |    |
| <b>HCT TYPES</b>  |   |                                    |                        |                        |                                     |     |      |              |     |               |       |     |    |
| High Level Input Voltage, V <sub>IH</sub>                           |   |                                    |                        | 4.5 to 5.5             | 2                                   | -   | -    | 2            | -   | 2             | -     | V   |    |
| Low Level Input Voltage, V <sub>IL</sub>                            |   |                                    |                        | 4.5 to 5.5             | -                                   | -   | 0.8  | -            | 0.8 | -             | 0.8   | V   |    |
| On Resistance, r <sub>ON</sub><br>I <sub>O</sub> = 1mA, (Figure 15) | V <sub>CC</sub> or V <sub>EE</sub>  | V <sub>IL</sub> or V <sub>IH</sub> | 0                      | 4.5                    | -                                   | 70  | 160  | -            | 200 | -             | 240   | Ω   |    |
|   |   |                                    | -                      | -                      | -                                   | -   | -    | -            | -   | -             | -     | Ω   |    |
|   |   |                                    | -4.5                   | 4.5                    | -                                   | 40  | 120  | -            | 150 | -             | 180   | Ω   |    |
|   | V <sub>CC</sub> to V <sub>EE</sub>  |                                    | 0                      | 4.5                    | -                                   | 90  | 180  | -            | 225 | -             | 270   | Ω   |    |
|   |   |                                    | -                      | -                      | -                                   | -   | -    | -            | -   | -             | -     | Ω   |    |
|   |   |                                    | -4.5                   | 4.5                    | -                                   | 45  | 130  | -            | 162 | -             | 195   | Ω   |    |
| Maximum On Resistance Between any Two Channels, Δr <sub>ON</sub>    |   |                                    | 0                      | 4.5                    | -                                   | 10  | -    | -            | -   | -             | Ω     |     |    |
|   |   |                                    | -                      | -                      | -                                   | -   | -    | -            | -   | -             | Ω     |     |    |
|   |   |                                    | -4.5                   | 4.5                    | -                                   | 5   | -    | -            | -   | -             | Ω     |     |    |
| Switch On/Off Leakage Current, I <sub>Iz</sub>                      | For Switch Off:<br>When V <sub>IS</sub> = V <sub>CC</sub> ,<br>V <sub>OS</sub> = V <sub>EE</sub> ;<br>When V <sub>IS</sub> = V <sub>EE</sub> ,<br>V <sub>OS</sub> = V <sub>CC</sub><br>For Switch On:<br>All Applicable<br>Combinations of<br>V <sub>IS</sub> and V <sub>OS</sub><br>Voltage Levels | V <sub>IL</sub> or V <sub>IH</sub> | 0                      | 6                      | -                                   | -   | ±0.1 | -            | ±1  | -             | ±1    | μA  |    |
|   |   |                                    | 1 and 2 Channels       | -5                     | 5                                   | -   | -    | ±0.1         | -   | ±1            | -     | ±1  | μA |
|   |   |                                    | 4053                   | 0                      | 6                                   | -   | -    | ±0.1         | -   | ±1            | -     | ±1  | μA |
|   |   |                                    | 4 Channels             | -5                     | 5                                   | -   | -    | ±0.2         | -   | ±2            | -     | ±2  | μA |
|   |   |                                    | 4052                   | 0                      | 6                                   | -   | -    | ±0.2         | -   | ±2            | -     | ±2  | μA |
|   |   |                                    | 8 Channels             | -5                     | 5                                   | -   | -    | ±0.4         | -   | ±4            | -     | ±4  | μA |
|   |   |                                    | 4051                   | 0                      | 6                                   | -   | -    | ±0.2         | -   | ±2            | -     | ±2  | μA |
| Control Input Leakage Current, I <sub>IL</sub>                      | -   | (Note 4)                           | -                      | 5.5                    | -                                   | -   | ±0.1 | -            | ±1  | -             | ±1    | μA  |    |
| Quiescent Device Current, I <sub>CC</sub><br>I <sub>O</sub> = 0     | When V <sub>IS</sub> = V <sub>EE</sub> ,<br>V <sub>OS</sub> = V <sub>CC</sub>   | V <sub>CC</sub> or GND             | 0                      | 5.5                    | -                                   | -   | 8    | -            | 80  | -             | 160   | μA  |    |
|   | When V <sub>IS</sub> = V <sub>CC</sub> ,<br>V <sub>OS</sub> = V <sub>EE</sub>   |                                    | -4.5                   | 5.5                    | -                                   | -   | 16   | -            | 160 | -             | 320   | μA  |    |
| Additional Quiescent Device Current Per Input Pin: 1 Unit Load      | ΔI <sub>CC</sub><br>(Note 5)  | V <sub>CC</sub> - 2.1              |                        | 4.5 to 5.5             | -                                   | 100 | 360  | -            | 450 | -             | 490   | μA  |    |

**NOTES:**

- Any voltage between V<sub>CC</sub> and GND.
- For dual supply systems theoretical worst case (V<sub>I</sub> = 2.4V, V<sub>CC</sub> = 5.5V) specification is 1.8mA.

**HCT Input Loading Table**

| TYPE       | INPUT | UNIT LOADS (NOTE) |
|------------|-------|-------------------|
| 4051, 4053 | All   | 0.5               |
| 4052       | All   | 0.4               |

NOTE: Unit load is ΔI<sub>CC</sub> limit specified in DC Specifications table, e.g., 360mA max. at 25°C.



**'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053**

**Switching Specifications**  $V_{CC} = 5V, T_A = 25^\circ C, \text{Input } t_r, t_f = 6ns$

| PARAMETER   | $C_L$<br>(pF) | TYPICAL |     |      |     |      |     | UNITS |
|---|---------------|---------|-----|------|-----|------|-----|-------|
|   |               | 4051    |     | 4052 |     | 4053 |     |       |
|   |               | HC      | HCT | HC   | HCT | HC   | HCT |       |
| Propagation Delay<br>Switch IN to OUT, $t_{PHL}, t_{PLH}$ | 15            | 4       | 4   | 4    | 4   | 4    | 4   | ns    |
| Switch Turn-Off (S or $\bar{E}$ ), $t_{PHZ}, t_{PLZ}$     | 15            | 19      | 19  | 21   | 21  | 18   | 18  | ns    |
| Switch Turn-On (S or $\bar{E}$ ), $t_{PZH}, t_{PZL}$      | 15            | 19      | 23  | 27   | 29  | 18   | 20  | ns    |
| Power Dissipation Capacitance, $C_{PD}$ (Note 6)          | -             | 50      | 52  | 74   | 76  | 38   | 42  | pF    |

NOTE:

6.  $C_{PD}$  is used to determine the dynamic power consumption, per package.  
 $P_D = C_{PD} V_{CC}^2 f_I + \sum (C_L + C_S) V_{CC}^2 f_O$   
 $f_O$  = output frequency  
 $f_I$  = input frequency  
 $C_L$  = output load capacitance  
 $C_S$  = switch capacitance  
 $V_{CC}$  = supply voltage

**Switching Specifications**  $C_L = 50pF, \text{Input } t_r, t_f = 6ns$

| PARAMETER   | $V_{EE}$<br>(V) | $V_{CC}$<br>(V) | AMBIENT TEMPERATURE, $T_A$ |     |     |     |              |     |     |     |               |     |     |    | UNITS |    |
|---|-----------------|-----------------|----------------------------|-----|-----|-----|--------------|-----|-----|-----|---------------|-----|-----|----|-------|----|
|   |                 |                 | 25°C                       |     |     |     | -40°C - 85°C |     |     |     | -55°C - 125°C |     |     |    |       |    |
|   |                 |                 | HC                         |     | HCT |     | HC           |     | HCT |     | HC            |     | HCT |    |       |    |
| MIN   | MAX             | MIN             | MAX                        | MIN | MAX | MIN | MAX          | MIN | MAX | MIN | MAX           | MIN | MAX |    |       |    |
| Propagation Delay, Switch<br>In to Out, $t_{PLH}, t_{PHL}$  | 0               | 2               | -                          | 60  | -   | -   | -            | 75  | -   | -   | -             | 90  | -   | -  | ns    |    |
|   | 0               | 4.5             | -                          | 12  | -   | 12  | -            | 15  | -   | 15  | -             | 18  | -   | 18 | ns    |    |
|   | 0               | 6               | -                          | 10  | -   | -   | -            | 13  | -   | -   | -             | 15  | -   | -  | ns    |    |
|   | -4.5            | 4.5             | -                          | 8   | -   | 8   | -            | 10  | -   | 10  | -             | 12  | -   | 12 | ns    |    |
| Maximum Switch<br>Turn "Off" Delay<br>from S or $\bar{E}$ to<br>Switch Output<br>$t_{PHZ}, t_{PLZ}$ | 4051            | 0               | 2                          | -   | 225 | -   | -            | -   | 280 | -   | -             | -   | 340 | -  | -     | ns |
|   |                 | 0               | 4.5                        | -   | 45  | -   | 45           | -   | 56  | -   | 56            | -   | 68  | -  | 68    | ns |
|   |                 | 0               | 6                          | -   | 38  | -   | -            | -   | 48  | -   | -             | -   | 57  | -  | -     | ns |
|   |                 | -4.5            | 4.5                        | -   | 32  | -   | 32           | -   | 40  | -   | 40            | -   | 48  | -  | 48    | ns |
|   | 4052            | 0               | 2                          | -   | 250 | -   | -            | -   | 315 | -   | -             | -   | 375 | -  | -     | ns |
|   |                 | 0               | 4.5                        | -   | 50  | -   | 50           | -   | 63  | -   | 63            | -   | 75  | -  | 75    | ns |
|   |                 | 0               | 6                          | -   | 43  | -   | -            | -   | 54  | -   | -             | -   | 65  | -  | -     | ns |
|   |                 | -4.5            | 4.5                        | -   | 38  | -   | 38           | -   | 48  | -   | 48            | -   | 57  | -  | 57    | ns |
|   | 4053            | 0               | 2                          | -   | 210 | -   | -            | -   | 265 | -   | -             | -   | 315 | -  | -     | ns |
|   |                 | 0               | 4.5                        | -   | 42  | -   | 44           | -   | 53  | -   | 55            | -   | 63  | -  | 66    | ns |
|   |                 | 0               | 6                          | -   | 36  | -   | -            | -   | 45  | -   | -             | -   | 54  | -  | -     | ns |
|   |                 | -4.5            | 4.5                        | -   | 29  | -   | 31           | -   | 36  | -   | 39            | -   | 44  | -  | 47    | ns |

**'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053**

**Switching Specifications**  $C_L = 50\text{pF}$ , Input  $t_r, t_f = 6\text{ns}$  (Continued)

| PARAMETER  |      | $V_{EE}$<br>(V) | $V_{CC}$<br>(V) | AMBIENT TEMPERATURE, $T_A$ |     |     |     |              |     |     |     |               |     |     |     | UNITS |
|--|------|-----------------|-----------------|----------------------------|-----|-----|-----|--------------|-----|-----|-----|---------------|-----|-----|-----|-------|
|  |      |                 |                 | 25°C                       |     |     |     | -40°C - 85°C |     |     |     | -55°C - 125°C |     |     |     |       |
|  |      |                 |                 | HC                         |     | HCT |     | HC           |     | HCT |     | HC            |     | HCT |     |       |
|  |      |                 |                 | MIN                        | MAX | MIN | MAX | MIN          | MAX | MIN | MAX | MIN           | MAX | MIN | MAX |       |
| Maximum Switch Turn "On" Delay from S or E to Switch Output $t_{PZL}, t_{PZH}$ | 4051 | 0               | 2               | -                          | 225 | -   | -   | -            | 280 | -   | -   | -             | 340 | -   | -   | ns    |
|  |      | 0               | 4.5             | -                          | 45  | -   | 55  | -            | 56  | -   | 69  | -             | 68  | -   | 83  | ns    |
|  |      | 0               | 6               | -                          | 38  | -   | -   | -            | 48  | -   | -   | -             | 57  | -   | -   | ns    |
|  |      | -4.5            | 4.5             | -                          | 32  | -   | 39  | -            | 40  | -   | 49  | -             | 48  | -   | 59  | ns    |
|  | 4052 | 0               | 2               | -                          | 325 | -   | -   | -            | 405 | -   | -   | -             | 490 | -   | -   | ns    |
|  |      | 0               | 4.5             | -                          | 65  | -   | 70  | -            | 81  | -   | 68  | -             | 98  | -   | 105 | ns    |
|  |      | 0               | 6               | -                          | 55  | -   | -   | -            | 69  | -   | -   | -             | 83  | -   | -   | ns    |
|  |      | -4.5            | 4.5             | -                          | 46  | -   | 48  | -            | 58  | -   | 60  | -             | 69  | -   | 72  | ns    |
|  | 4053 | 0               | 2               | -                          | 220 | -   | -   | -            | 275 | -   | -   | -             | 330 | -   | -   | ns    |
|  |      | 0               | 4.5             | -                          | 44  | -   | 48  | -            | 55  | -   | 60  | -             | 66  | -   | 72  | ns    |
|  |      | 0               | 6               | -                          | 37  | -   | -   | -            | 47  | -   | -   | -             | 56  | -   | -   | ns    |
|  |      | -4.5            | 4.5             | -                          | 31  | -   | 34  | -            | 39  | -   | 43  | -             | 47  | -   | 51  | ns    |
| Input (Control) Capacitance, $C_1$   | -    | -               | -               | 10                         | -   | 10  | -   | 10           | -   | 10  | -   | 10            | -   | 10  | pF  |       |

**Analog Channel Specifications** Typical Values at  $T_A = 25^\circ\text{C}$

| PARAMETER   | TEST CONDITIONS           | HC/HCT TYPES | $V_{EE}$<br>(V) | $V_{CC}$<br>(V) | HC/HCT | UNITS |
|---|---------------------------|--------------|-----------------|-----------------|--------|-------|
| Switch Input Capacitance, $C_1$   |                           | All          | -               | -               | 5      | pF    |
| Common Output Capacitance, $C_{COM}$                                      |                           | 4051         | -               | -               | 25     | pF    |
|   |                           | 4052         | -               | -               | 12     | pF    |
|   |                           | 4053         | -               | -               | 8      | pF    |
| Minimum Switch Frequency Response at -3dB, $f_{MAX}$ (Figures 12, 14, 16) | See Figure 3 (Notes 7, 8) | 4051         | -2.25           | 2.25            | 145    | MHz   |
|   |                           | 4052         |                 |                 | 165    | MHz   |
|   |                           | 4053         |                 |                 | 200    | MHz   |
|   |                           | 4051         | -4.5            | 4.5             | 180    | MHz   |
|   |                           | 4052         |                 |                 | 185    | MHz   |
|   |                           | 4053         |                 |                 | 200    | MHz   |

**'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053**

**Analog Channel Specifications** Typical Values at  $T_A = 25^\circ\text{C}$

| PARAMETER  | TEST CONDITIONS           | HC/HCT TYPES | $V_{EE}$ (V) | $V_{CC}$ (V) | HC/HCT | UNITS |
|--|---------------------------|--------------|--------------|--------------|--------|-------|
| Crosstalk Between any Two Switches (Note 10)         | See Figure 4 (Notes 8, 9) | 4051         | -2.25        | 2.25         | N/A    | dB    |
|  |                           | 4052         |              |              | (TBE)  | dB    |
|  |                           | 4053         |              |              | (TBE)  | dB    |
|  |                           | 4051         | -4.5         | 4.5          | N/A    | dB    |
|  |                           | 4052         |              |              | (TBE)  | dB    |
|  |                           | 4053         |              |              | (TBE)  | dB    |
| Sinewave Distortion                                  | See Figure 5              | All          | -2.25        | 2.25         | 0.035  | %     |
|  |                           | All          | -4.5         | 4.5          | 0.018  | %     |
| $\bar{E}$ or S to Switch Feedthrough Noise           | See Figure 6 (Notes 8, 9) | 4051         | -2.25        | 2.25         | (TBE)  | mV    |
|  |                           | 4052         |              |              |        | mV    |
|  |                           | 4053         |              |              |        | mV    |
|  |                           | 4051         | -4.5         | 4.5          | (TBE)  | mV    |
|  |                           | 4052         |              |              |        | mV    |
|  |                           | 4053         |              |              |        | mV    |
| Switch "OFF" Signal Feedthrough (Figures 13, 15, 17) | See Figure 7 (Notes 8, 9) | 4051         | -2.25        | 2.25         | -73    | dB    |
|  |                           | 4052         |              |              | -65    | dB    |
|  |                           | 4053         |              |              | -64    | dB    |
|  |                           | 4051         | -4.5         | 4.5          | -75    | dB    |
|  |                           | 4052         |              |              | -67    | dB    |
|  |                           | 4053         |              |              | -66    | dB    |

NOTES:

7. Adjust input voltage to obtain 0dBm at  $V_{OS}$  for  $f_{IN} = 1\text{MHz}$ .
8.  $V_{IS}$  is centered at  $(V_{CC} - V_{EE})/2$ .
9. Adjust input for 0dBm.
10. Not applicable for HC/HCT4051.

Test Circuits and Waveforms

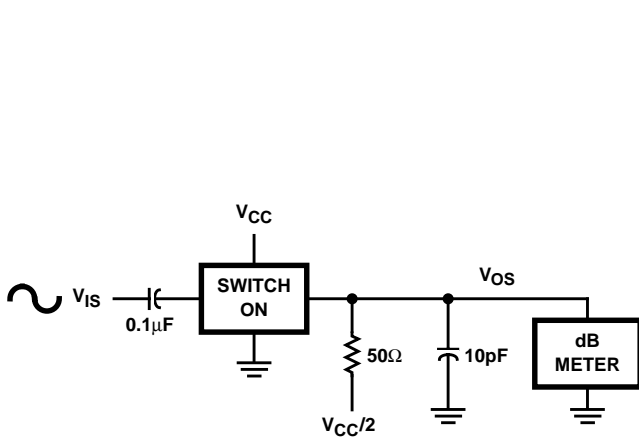


FIGURE 3. FREQUENCY RESPONSE TEST CIRCUIT

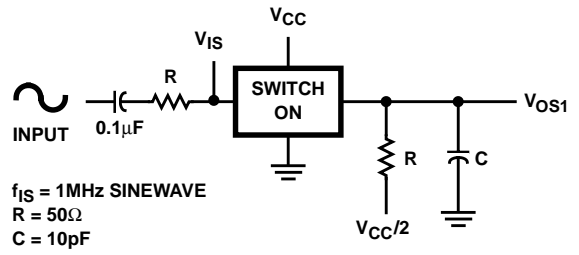


FIGURE 4. CROSSTALK BETWEEN TWO SWITCHES TEST CIRCUIT

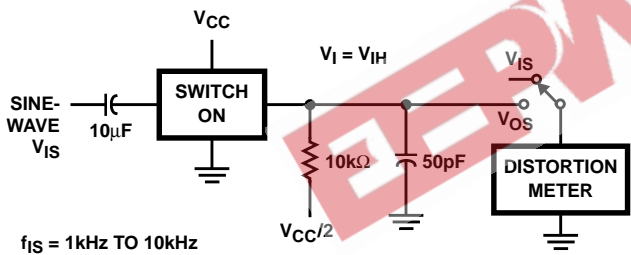
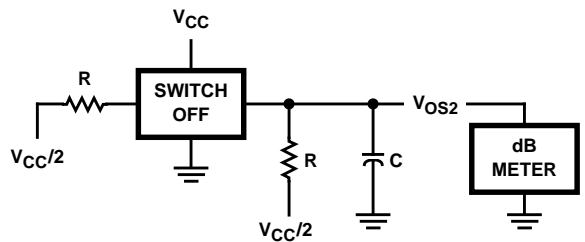


FIGURE 5. SINEWAVE DISTORTION TEST CIRCUIT

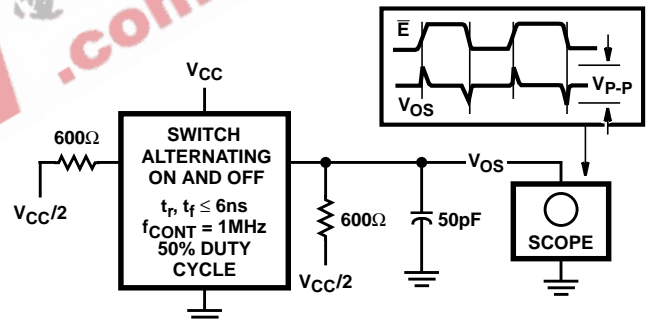


FIGURE 6. CONTROL TO SWITCH FEEDTHROUGH NOISE TEST CIRCUIT

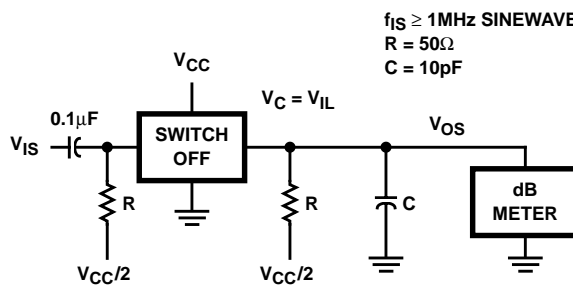


FIGURE 7. SWITCH OFF SIGNAL FEEDTHROUGH

'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053

Test Circuits and Waveforms (Continued)

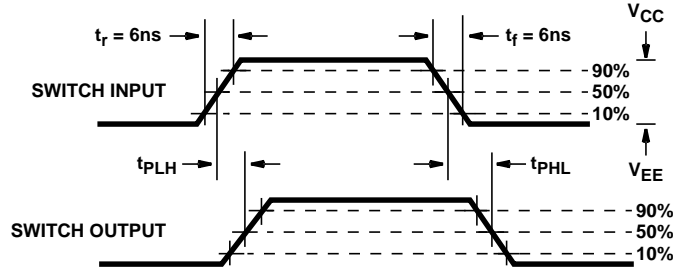


FIGURE 8A.

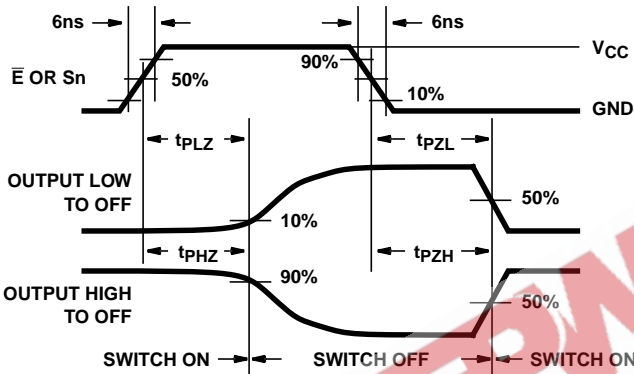


FIGURE 8B. HC TYPES

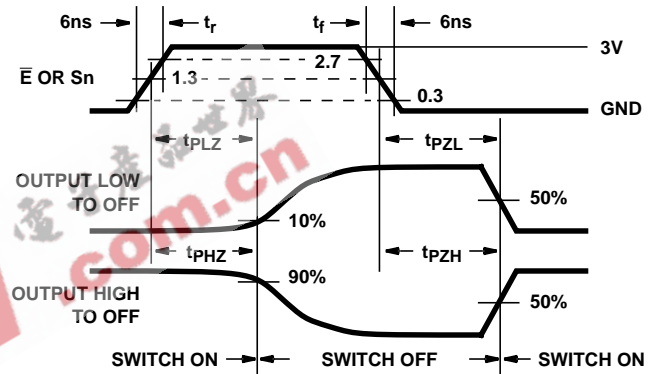


FIGURE 8C. HCT TYPES

FIGURE 8. SWITCH PROPAGATION DELAY, TURN-ON, TURN-OFF TIMES

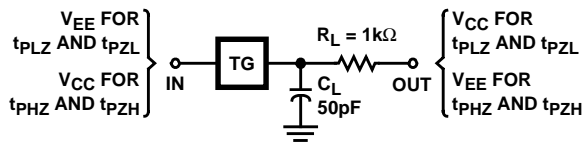


FIGURE 9. SWITCH ON/OFF PROPAGATION DELAY TEST CIRCUIT

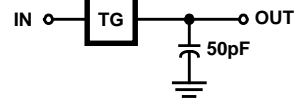


FIGURE 10. SWITCH IN TO SWITCH OUT PROPAGATION DELAY TEST CIRCUIT

'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053

Typical Performance Curves

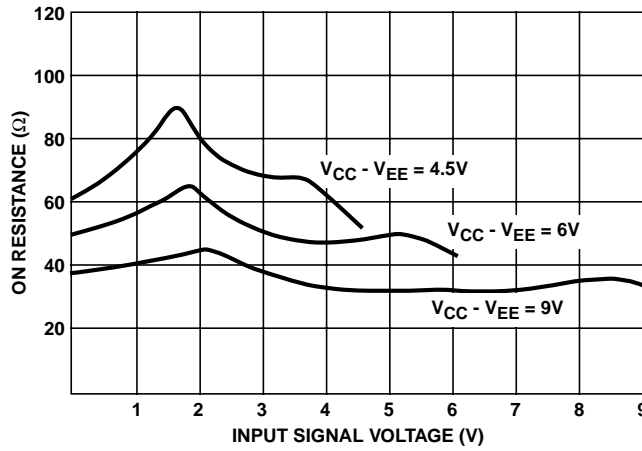


FIGURE 11. TYPICAL ON RESISTANCE vs INPUT SIGNAL VOLTAGE

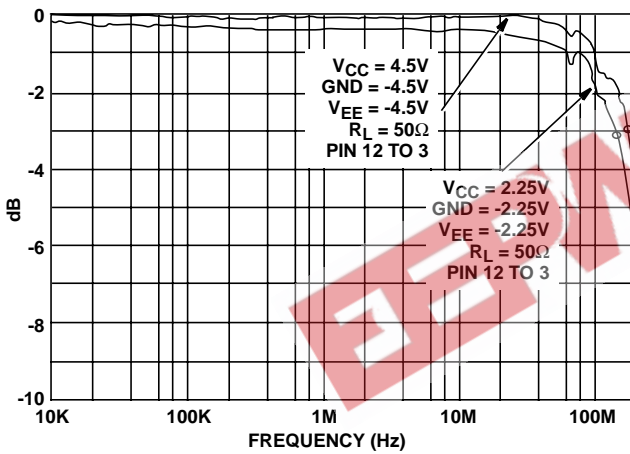


FIGURE 12. CHANNEL ON BANDWIDTH (HC/HCT4051)

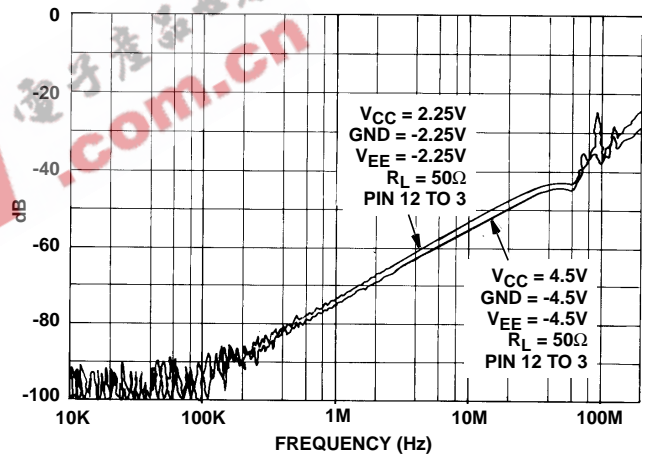


FIGURE 13. CHANNEL OFF FEEDTHROUGH (HC/HCT4051)

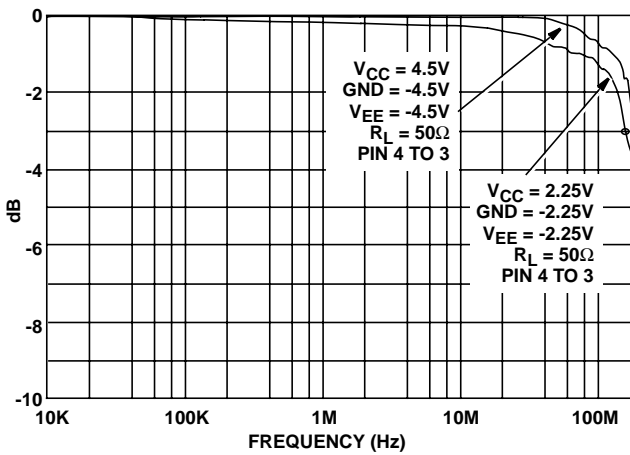


FIGURE 14. CHANNEL ON BANDWIDTH (HC/HCT4052)

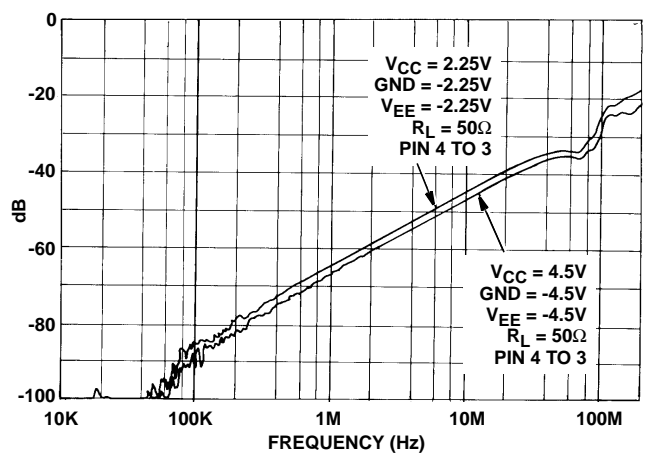


FIGURE 15. CHANNEL OFF FEEDTHROUGH (HC/HCT4052)

'HC4051, 'HCT4051, 'HC4052, CD74HCT4052, 'HC4053, CD74HCT4053

Typical Performance Curves (Continued)

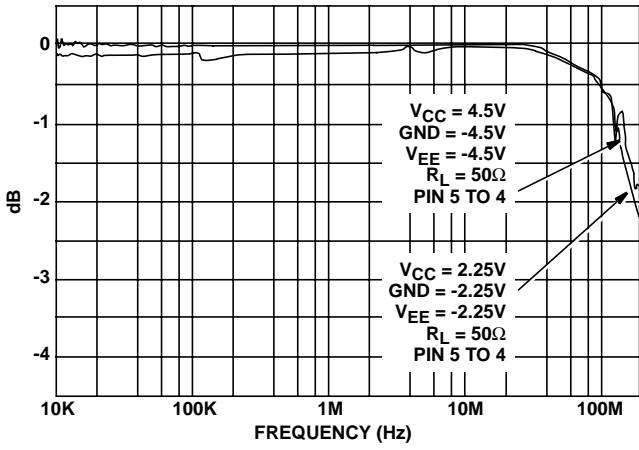


FIGURE 16. CHANNEL ON BANDWIDTH (HC/HCT4053)

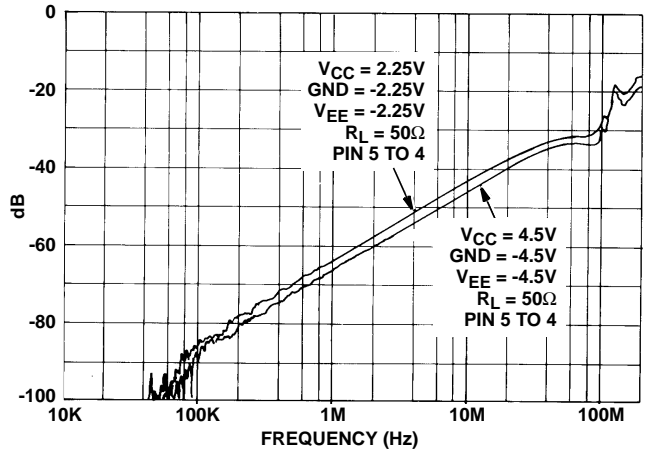


FIGURE 17. CHANNEL OFF FEEDTHROUGH (HC/HCT4053)

EEPW 电子产品世界 .com.cn

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-8775401EA   | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| 5962-8855601EA   | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| 5962-9065401MEA  | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD54HC4051F      | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD54HC4051F3A    | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD54HC4052F      | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD54HC4052F3A    | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD54HC4053F      | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD54HC4053F3A    | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD54HCT4051F3A   | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| CD74HC4051E      | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HC4051EE4    | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HC4051M      | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051M96    | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051M96E4  | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051ME4    | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051MT     | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051MTE4   | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051NSR    | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051NSRE4  | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051PWR    | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051PWRG4  | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051PWT    | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4051PWTE4  | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052E      | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HC4052EE4    | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HC4052M      | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052M96    | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052M96E4  | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |



| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| CD74HC4052ME4    | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052MT     | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052MTE4   | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052NSR    | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052NSRE4  | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052PW     | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052PWG4   | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052PWR    | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052PWRG4  | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052PWT    | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052PWTE4  | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4052SM     | OBSOLETE              | SSOP         | DB              | 16   |             | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053E      | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HC4053EE4    | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HC4053M      | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053M96    | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053M96E4  | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053ME4    | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053MT     | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053MTE4   | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053NSR    | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053NSRG4  | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053PW     | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053PWG4   | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053PWR    | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053PWRG4  | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| CD74HC4053PWT    | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HC4053PWTG4  | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4051E     | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HCT4051EE4   | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HCT4051M     | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4051M96   | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4051M96E4 | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4051M96G4 | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4051ME4   | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4051MG4   | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4051MT    | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4051MTE4  | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4052E     | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HCT4052EE4   | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HCT4052M     | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4052M96   | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4052M96E4 | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4052M96G4 | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4052MG4   | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4052MT    | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4052MTE4  | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053E     | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HCT4053EE4   | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| CD74HCT4053M     | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053M96   | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053M96E4 | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| CD74HCT4053ME4   | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053MT    | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053MTE4  | ACTIVE                | SOIC         | D               | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053PWR   | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053PWRE4 | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053PWRG4 | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053PWT   | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053PWTE4 | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CD74HCT4053PWTG4 | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

**Important Information and Disclaimer:**The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

J (R-GDIP-T\*\*)  
14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14                     | 16                     | 18                     | 20                     |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A             | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX         | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN         | —                      | —                      | —                      | —                      |
| C MAX         | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN         | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |



4040083/F 03/03

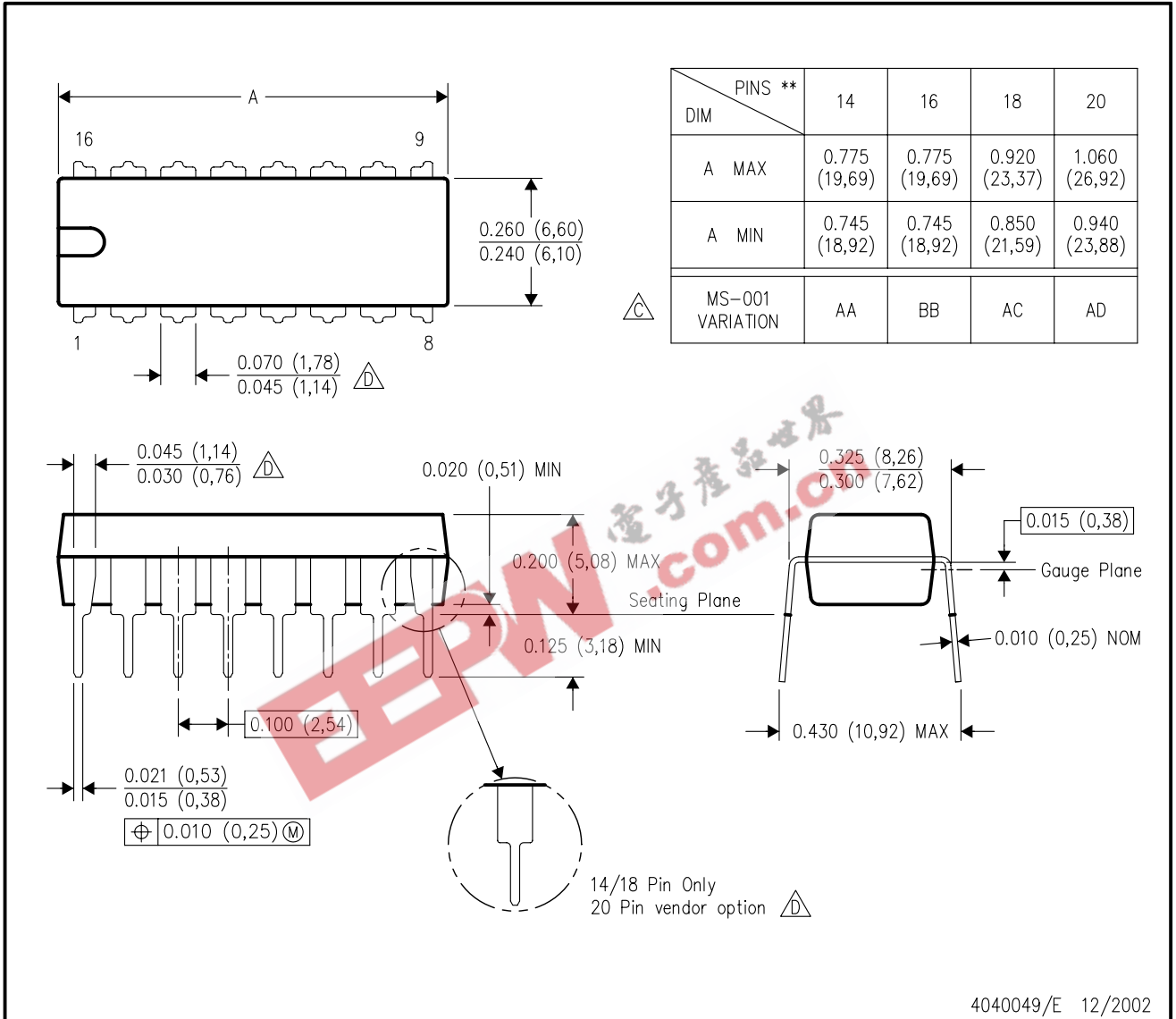
- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

# MECHANICAL DATA

## N (R-PDIP-T\*\*)

## PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



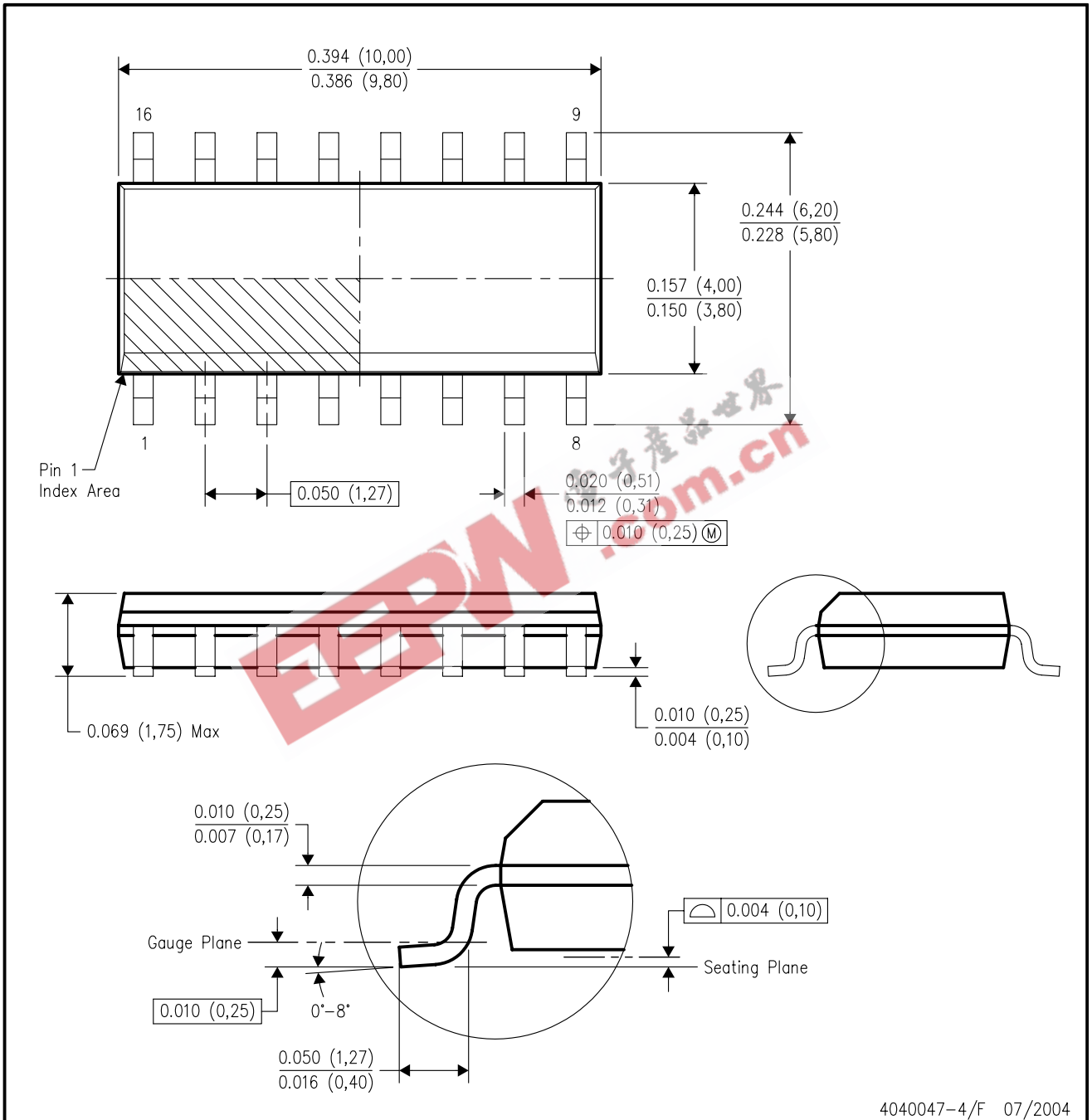
- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.

- △ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).  
 △ The 20 pin end lead shoulder width is a vendor option, either half or full width.

# MECHANICAL DATA

## D (R-PDSO-G16)

## PLASTIC SMALL-OUTLINE PACKAGE



4040047-4/F 07/2004

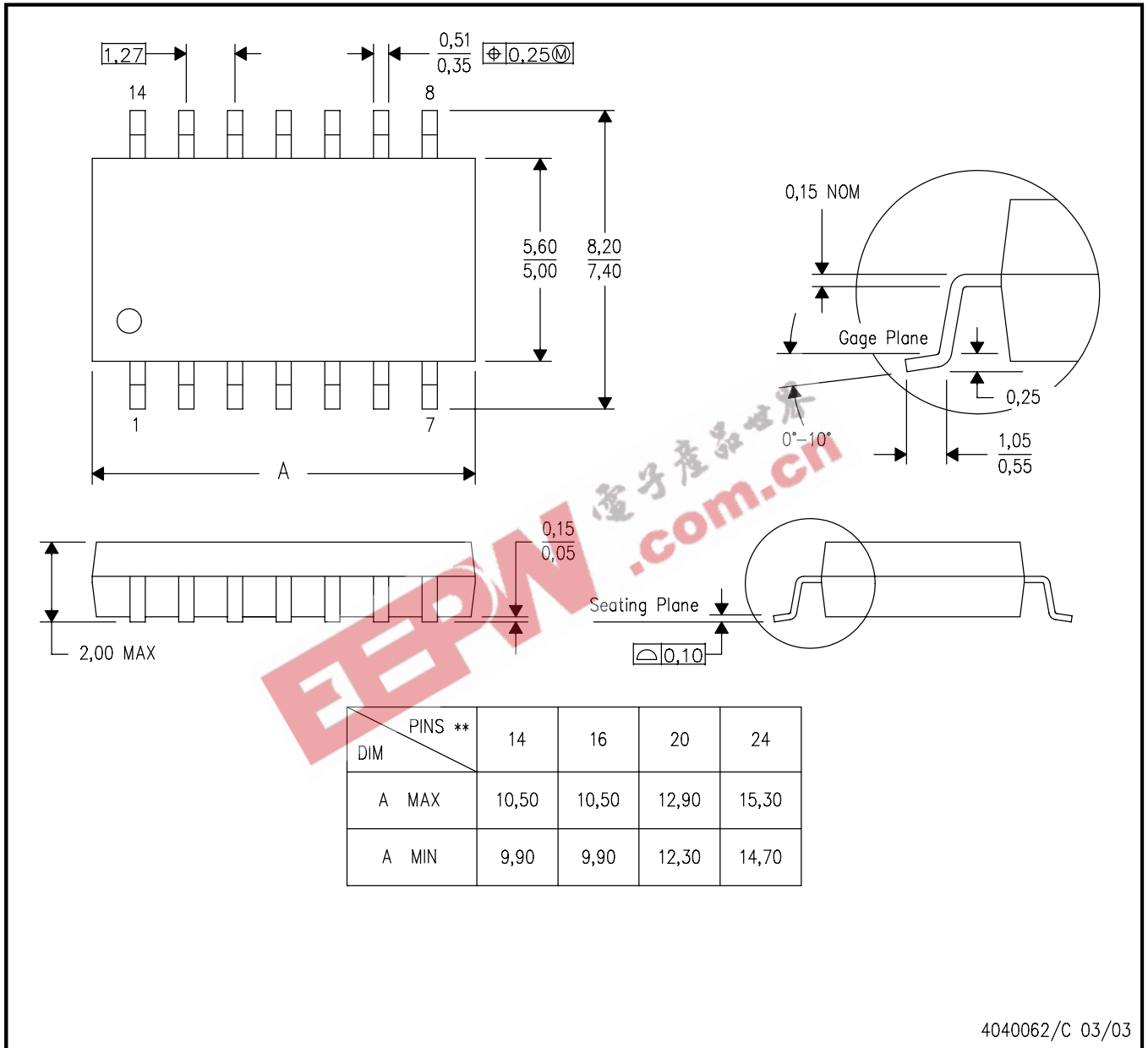
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0.15).
  - D. Falls within JEDEC MS-012 variation AC.

## MECHANICAL DATA

**NS (R-PDSO-G\*\*)**

**PLASTIC SMALL-OUTLINE PACKAGE**

**14-PINS SHOWN**



4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

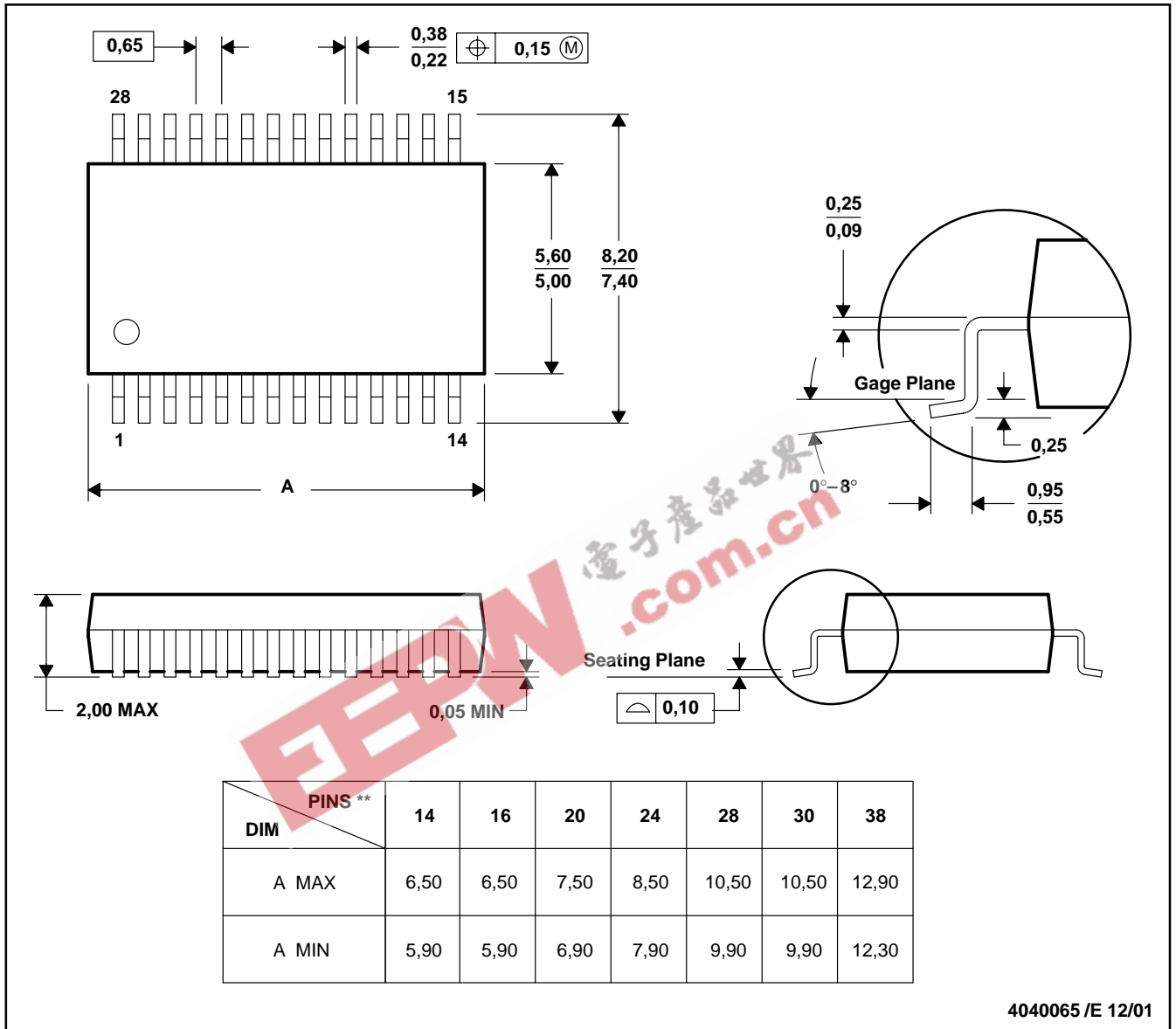
# MECHANICAL DATA

MSS0002E – JANUARY 1995 – REVISED DECEMBER 2001

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150



# MECHANICAL DATA

MTSS001C – JANUARY 1995 – REVISED FEBRUARY 1999

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

| <b>Products</b>  |  | <b>Applications</b> |  |
|------------------|--|---------------------|--|
| Amplifiers       | <a href="http://amplifier.ti.com">amplifier.ti.com</a>             | Audio               | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                   |
| Data Converters  | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>     | Automotive          | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>         |
| DSP              | <a href="http://dsp.ti.com">dsp.ti.com</a>                         | Broadband           | <a href="http://www.ti.com/broadband">www.ti.com/broadband</a>           |
| Interface        | <a href="http://interface.ti.com">interface.ti.com</a>             | Digital Control     | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
| Logic            | <a href="http://logic.ti.com">logic.ti.com</a>                     | Military            | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
| Power Mgmt       | <a href="http://power.ti.com">power.ti.com</a>                     | Optical Networking  | <a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a> |
| Microcontrollers | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a> | Security            | <a href="http://www.ti.com/security">www.ti.com/security</a>             |
|                  |  | Telephony           | <a href="http://www.ti.com/telephony">www.ti.com/telephony</a>           |
|                  |  | Video & Imaging     | <a href="http://www.ti.com/video">www.ti.com/video</a>                   |
|                  |  | Wireless            | <a href="http://www.ti.com/wireless">www.ti.com/wireless</a>             |

Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265