

## SN74HC4066 quadruple bilateral analog switch

### 1 Features

- Wide Operating Voltage Range of 2 V to 6 V
- Typical Switch Enable Time of 18 ns
- Low Power Consumption, 20- $\mu$ A Maximum  $I_{CC}$
- Low Input Current of 1  $\mu$ A Maximum
- High Degree of Linearity
- High On-Off Output-Voltage Ratio
- Low Crosstalk Between Switches
- Low On-State Impedance: 50- $\Omega$  Typical at  $V_{CC} = 6$  V
- Individual Switch Controls

### 2 Applications

- Analog Signal Switching/Multiplexing:
  - Signal Gating, Modulator, Squelch Control, Demodulator, Chopper, Commutating Switch
- Digital Signal Switching/Multiplexing
  - Audio and Video Signal Routing
- Transmission-Gate Logic Implementation
- Analog-to-Digital and Digital-to-Analog Conversion
- Digital Control of Frequency, Impedance, Phase, and Analog-Signal Gain
- Motor Speed Control
- Battery Chargers
- DC-DC Converter

### 3 Description

The SN74HC4066 device is a silicon-gate CMOS quadruple analog switch designed to handle both analog and digital signals. Each switch permits signals with amplitudes of up to 6 V (peak) to be transmitted in either direction.

Each switch section has its own enable input control (C). A high-level voltage applied to C turns on the associated switch section.

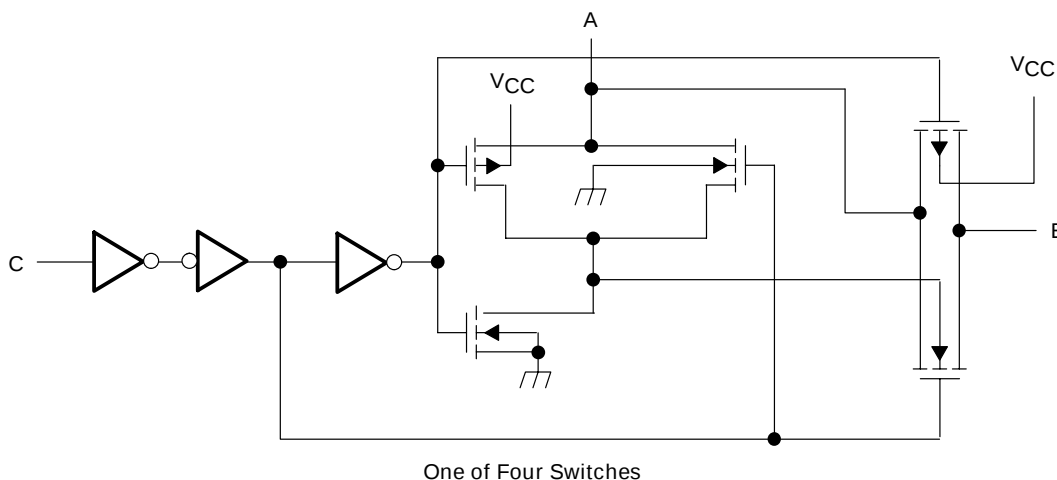
Applications include signal gating, chopping, modulation or demodulation (modem), and signal multiplexing for analog-to-digital and digital-to-analog conversion systems.

#### Device Information<sup>(1)</sup>

| PART NUMBER  | PACKAGE (PINS) | BODY SIZE (NOM)           |
|--------------|----------------|---------------------------|
| SN74HC4066D  | SOIC (14)      | 8.65 mm $\times$ 3.91 mm  |
| SN74HC4066DB | SSOP (14)      | 6.20 mm $\times$ 5.30 mm  |
| SN74HC4066PW | TSSOP (14)     | 5.00 mm $\times$ 4.40 mm  |
| SN74HC4066N  | PDIP (14)      | 19.30 mm $\times$ 6.35 mm |
| SN74HC4066NS | SO (14)        | 10.30 mm $\times$ 5.30 mm |

(1) For all available packages, see the orderable addendum at the end of the data sheet.

#### Logic Diagram, Each Switch (Positive Logic)



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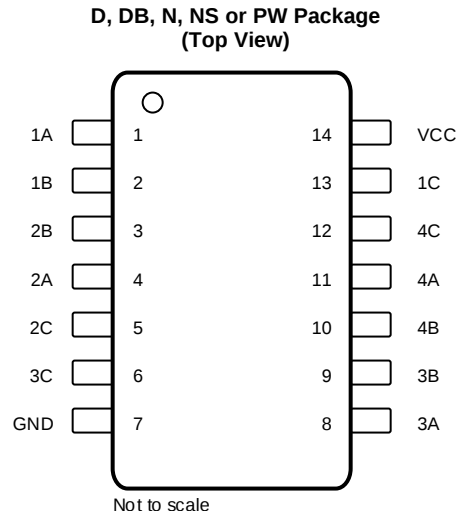
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## 4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| Changes from Revision I (January 2019) to Revision J                                                                                                                                                                                                                                                                                                                                                                                                                                              | Page                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| <ul style="list-style-type: none"> <li>Changed the MAX values for <math>I_{\text{soff}}</math>, <math>I_{\text{son}}</math>, and <math>I_{\text{CC}}</math> in the <i>Electrical Characteristics</i> table .....</li> </ul>                                                                                                                                                                                                                                                                       | <b>5</b>             |
| Changes from Revision H (August 2016) to Revision I                                                                                                                                                                                                                                                                                                                                                                                                                                               | Page                 |
| <ul style="list-style-type: none"> <li>Changed the Description of pins 8 through 12 in the <i>Pin Functions</i> table .....</li> </ul>                                                                                                                                                                                                                                                                                                                                                            | <b>3</b>             |
| Changes from Revision G (July 2003) to Revision H                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Page                 |
| <ul style="list-style-type: none"> <li>Added <i>ESD Ratings</i> table, <i>Feature Description</i> section, <i>Device Functional Modes</i>, <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section .....</li> <li>Deleted <i>Ordering Information</i> table, see POA at the end of the datasheet .....</li> </ul> | <b>1</b><br><b>1</b> |

## 5 Pin Configuration and Functions



### Pin Functions

| PIN |                 | I/O | DESCRIPTION           |
|-----|-----------------|-----|-----------------------|
| NO. | NAME            |     |                       |
| 1   | 1A              | I/O | Switch 1 input/output |
| 2   | 1B              | I/O | Switch 1 output/input |
| 3   | 2B              | I/O | Switch 2 output/input |
| 4   | 2A              | I/O | Switch 2 input/output |
| 5   | 2C              | I   | Switch 2 control      |
| 6   | 3C              | I   | Switch 3 control      |
| 7   | GND             | —   | Ground                |
| 8   | 3A              | I/O | Switch 3 input/output |
| 9   | 3B              | I/O | Switch 3 output/input |
| 10  | 4B              | I/O | Switch 4 output/input |
| 11  | 4A              | I/O | Switch 4 input/output |
| 12  | 4C              | I   | Switch 4 control      |
| 13  | 1C              | I   | Switch 1 control      |
| 14  | V <sub>CC</sub> | —   | Power                 |

## 6 Specifications

### 6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|                  |                                                   | MIN                                                      | MAX | UNIT   |
|------------------|---------------------------------------------------|----------------------------------------------------------|-----|--------|
| V <sub>CC</sub>  | Supply voltage <sup>(2)</sup>                     | −0.5                                                     | 7   | V      |
| I <sub>I</sub>   | Control-input diode current                       | V <sub>I</sub> < 0 or V <sub>I</sub> > V <sub>CC</sub>   |     | ±20 mA |
| I <sub>I</sub>   | I/O port diode current                            | V <sub>I</sub> < 0 or V <sub>I/O</sub> > V <sub>CC</sub> |     | ±20 mA |
|                  | On-state switch current                           | V <sub>I/O</sub> = 0 to V <sub>CC</sub>                  |     | ±25 mA |
|                  | Continuous current through V <sub>CC</sub> or GND |                                                          |     | ±50 mA |
| T <sub>J</sub>   | Junction temperature                              |                                                          |     | 150 °C |
| T <sub>stg</sub> | Storage temperature                               | −60                                                      | 150 | °C     |

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltages are with respect to ground unless otherwise specified.

### 6.2 ESD Ratings

|                    |                         | VALUE                                                                          | UNIT  |
|--------------------|-------------------------|--------------------------------------------------------------------------------|-------|
| V <sub>(ESD)</sub> | Electrostatic discharge | Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>              | ±1000 |
|                    |                         | Charged-device model (CDM), per JEDEC specification JESD22-C101 <sup>(2)</sup> | ±1000 |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. CDM value for N package only.

### 6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|                  |                                          | MIN                     | NOM  | MAX             | UNIT |
|------------------|------------------------------------------|-------------------------|------|-----------------|------|
| V <sub>CC</sub>  | Supply voltage                           | 2 <sup>(2)</sup>        | 5    | 6               | V    |
| V <sub>I/O</sub> | I/O port voltage                         | 0                       |      | V <sub>CC</sub> | V    |
| V <sub>IH</sub>  | High-level input voltage, control inputs | V <sub>CC</sub> = 2 V   | 1.5  | V <sub>CC</sub> | V    |
|                  |                                          | V <sub>CC</sub> = 4.5 V | 3.15 | V <sub>CC</sub> |      |
|                  |                                          | V <sub>CC</sub> = 6 V   | 4.2  | V <sub>CC</sub> |      |
| V <sub>IL</sub>  | Low-level input voltage, control inputs  | V <sub>CC</sub> = 2 V   | 0    | 0.3             | V    |
|                  |                                          | V <sub>CC</sub> = 4.5 V | 0    | 0.9             |      |
|                  |                                          | V <sub>CC</sub> = 6 V   | 0    | 1.2             |      |
| Δt/Δv            | Input transition rise and fall time      | V <sub>CC</sub> = 2 V   |      | 1000            | ns   |
|                  |                                          | V <sub>CC</sub> = 4.5 V |      | 500             |      |
|                  |                                          | V <sub>CC</sub> = 6 V   |      | 400             |      |
| T <sub>A</sub>   | Operating free-air temperature           | −40                     |      | 85              | °C   |

- (1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. See the TI application report, *Implications of Slow or Floating CMOS Inputs* (SCBA004).
- (2) With supply voltages at or near 2 V, the analog switch on-state resistance becomes very nonlinear. It is recommended that only digital signals be transmitted at these low supply voltages.

## 6.4 Thermal Information

| THERMAL METRIC <sup>(1)</sup> |                                              | SN74HC4066  |              |             |            |               | UNIT |
|-------------------------------|----------------------------------------------|-------------|--------------|-------------|------------|---------------|------|
|                               |                                              | D<br>(SOIC) | DB<br>(SSOP) | N<br>(PDIP) | NS<br>(SO) | PW<br>(TSSOP) |      |
|                               |                                              | 14 PINS     | 14 PINS      | 14 PINS     | 14 PINS    | 14 PINS       |      |
| $R_{\theta JA}$               | Junction-to-ambient thermal resistance       | 89.4        | 103.6        | 53.2        | 87.6       | 118.5         | °C/W |
| $R_{\theta JC(top)}$          | Junction-to-case (top) thermal resistance    | 49.5        | 55.6         | 40.5        | 45.4       | 47.3          | °C/W |
| $R_{\theta JB}$               | Junction-to-board thermal resistance         | 43.6        | 50.8         | 33.1        | 46.3       | 60.2          | °C/W |
| $\Psi_{JT}$                   | Junction-to-top characterization parameter   | 17.2        | 21           | 25.3        | 15.8       | 5.2           | °C/W |
| $\Psi_{JB}$                   | Junction-to-board characterization parameter | 43.4        | 50.3         | 33          | 46         | 59.6          | °C/W |

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

## 6.5 Electrical Characteristics

$T_A = -40$  to  $+85$  °C unless otherwise specified.

| PARAMETER   |                                  | TEST CONDITIONS                                                                             | $V_{CC}$             | MIN   | TYP       | MAX        | UNIT     |
|-------------|----------------------------------|---------------------------------------------------------------------------------------------|----------------------|-------|-----------|------------|----------|
| $r_{on}$    | On-state switch resistance       | $I_T = -1$ mA, $V_I = 0$ to $V_{CC}$ ,<br>$V_C = V_{IH}$ (see <a href="#">Figure 2</a> )    | $T_A = 25$ C         | 2 V   | 150       |            | $\Omega$ |
|             |                                  |                                                                                             | $T_A = 25$ C         | 4.5 V | 50        | 85         |          |
|             |                                  |                                                                                             | $T_A = -40$ to $+85$ |       |           | 106        |          |
|             |                                  |                                                                                             | $T_A = 25$ C         | 6 V   | 30        |            |          |
| $r_{on(p)}$ | Peak on-state resistance         | $V_I = V_{CC}$ or GND, $V_C = V_{IH}$ ,<br>$I_T = -1$ mA                                    | $T_A = 25$ C         | 2 V   | 320       |            | $\Omega$ |
|             |                                  |                                                                                             | $T_A = 25$ C         | 4.5 V | 70        | 170        |          |
|             |                                  |                                                                                             | $T_A = -40$ to $+85$ |       |           | 215        |          |
|             |                                  |                                                                                             | $T_A = 25$ C         | 6 V   | 50        |            |          |
| $I_I$       | Control input current            | $V_C = 0$ or $V_{CC}$                                                                       | $T_A = -40$ to $+85$ | 6 V   | $\pm 0.1$ | $\pm 100$  | nA       |
|             |                                  |                                                                                             | $T_A = 25$ C         |       |           | $\pm 1000$ |          |
| $I_{soff}$  | Off-state switch leakage current | $V_I = V_{CC}$ or 0, $V_O = V_{CC}$ or 0,<br>$V_C = V_{IL}$ (see <a href="#">Figure 3</a> ) | $T_A = -40$ to $+85$ | 6 V   |           | $\pm 5$    | $\mu$ A  |
|             |                                  |                                                                                             | $T_A = 25$ C         |       |           | $\pm 0.1$  |          |
| $I_{son}$   | On-state switch leakage current  | $V_I = V_{CC}$ or 0, $V_C = V_{IH}$<br>(see <a href="#">Figure 4</a> )                      | $T_A = -40$ to $+85$ | 6 V   |           | $\pm 5$    | $\mu$ A  |
|             |                                  |                                                                                             | $T_A = 25$ C         |       |           | $\pm 0.1$  |          |
| $I_{CC}$    | Supply current                   | $V_I = 0$ or $V_{CC}$ , $I_O = 0$                                                           | $T_A = -40$ to $+85$ | 6 V   |           | 20         | $\mu$ A  |
|             |                                  |                                                                                             | $T_A = 25$ C         |       |           | 2          |          |
| $C_i$       | Input capacitance                | A or B                                                                                      | $T_A = 25$ C         | 5 V   |           | 9          | pF       |
|             |                                  | C                                                                                           | $T_A = -40$ to $+85$ |       |           | 3          |          |
|             |                                  |                                                                                             | $T_A = 25$ C         |       |           | 10         |          |
| $C_f$       | Feed-through capacitance         | A to B                                                                                      | $V_I = 0$            |       |           | 0.5        | pF       |
| $C_o$       | Output capacitance               | A or B                                                                                      |                      | 5 V   |           | 9          | pF       |

## 6.6 Switching Characteristics

 $T_A = -40$  to  $+85$  °C unless otherwise specified.

| PARAMETER                                       | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS                                                                                                | $V_{CC}$                 | MIN   | TYP | MAX | UNIT     |
|-------------------------------------------------|--------------|-------------|----------------------------------------------------------------------------------------------------------------|--------------------------|-------|-----|-----|----------|
| $t_{PLH}$ ,<br>$t_{PHL}$ Propagation delay time | A or B       | B or A      | $C_L = 50$ pF (see Figure 5)                                                                                   | $T_A = 25^\circ\text{C}$ | 2 V   | 10  | 60  | ns       |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 75  |          |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 4.5 V | 4   | 12  |          |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 15  |          |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 6 V   | 3   | 10  |          |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 13  |          |
| $t_{PZH}$ ,<br>$t_{PZL}$ Switch turn-on time    | C            | A or B      | $R_L = 1$ k $\Omega$ ,<br>$C_L = 50$ pF (see Figure 6)                                                         | $T_A = 25^\circ\text{C}$ | 2 V   | 70  | 180 | ns       |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 225 |          |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 4.5 V | 21  | 36  |          |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 45  |          |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 6 V   | 18  | 31  |          |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 38  |          |
| $t_{PLZ}$ ,<br>$t_{PHZ}$ Switch turn-off time   | C            | A or B      | $R_L = 1$ k $\Omega$ ,<br>$C_L = 50$ pF (see Figure 6)                                                         | $T_A = 25^\circ\text{C}$ | 2 V   | 50  | 200 | ns       |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 250 |          |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 4.5 V | 25  | 40  |          |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 50  |          |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 6 V   | 22  | 34  |          |
|                                                 |              |             |                                                                                                                | $T_A = -40$ to $+85$     |       |     | 43  |          |
| $f_i$ Control input frequency                   | C            | A or B      | $C_L = 15$ pF,<br>$R_L = 1$ k $\Omega$ ,<br>$V_C = V_{CC}$ or GND,<br>$V_O = V_{CC} / 2$ (see Figure 7)        | $T_A = 25^\circ\text{C}$ | 2 V   | 15  |     | MHz      |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 4.5 V | 30  |     |          |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 6 V   | 30  |     |          |
| Control feed-through noise                      | C            | A or B      | $C_L = 50$ pF,<br>$R_{in} = R_L = 600$ $\Omega$ ,<br>$V_C = V_{CC}$ or GND,<br>$f_{in} = 1$ MHz (see Figure 8) | $T_A = 25^\circ\text{C}$ | 4.5 V | 15  |     | mV (rms) |
|                                                 |              |             |                                                                                                                | $T_A = 25^\circ\text{C}$ | 6 V   | 20  |     |          |

## 6.7 Operating Characteristics

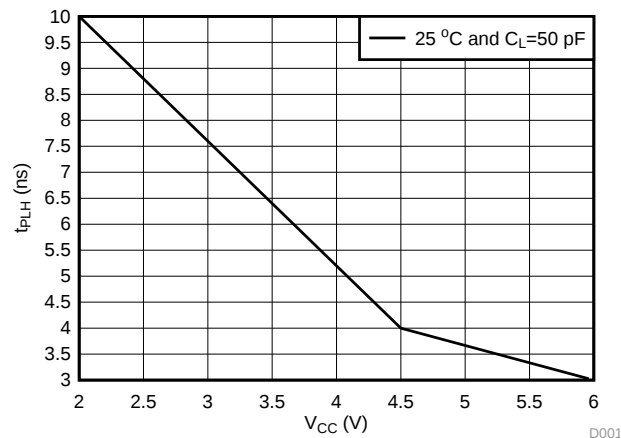
 $V_{CC} = 4.5$  V,  $T_A = 25^\circ\text{C}$ 

| PARAMETER                                                                                  | TEST CONDITIONS                                                            | TYP   | UNIT |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------|------|
| $C_{pd}$ Power dissipation capacitance per gate                                            | $C_L = 50$ pF, $f = 1$ MHz                                                 | 45    | pF   |
| Minimum through bandwidth, A to B or B to A <sup>(1)</sup> $[20 \log (V_O / V_i)] = -3$ dB | $C_L = 50$ pF, $R_L = 600$ $\Omega$ ,<br>$V_C = V_{CC}$ (see Figure 9)     | 30    | MHz  |
| Crosstalk between any switches <sup>(2)</sup>                                              | $C_L = 10$ pF, $R_L = 50$ $\Omega$ ,<br>$f_{in} = 1$ MHz (see Figure 10)   | 45    | dB   |
| Feed through, switch off, A to B or B to A <sup>(2)</sup>                                  | $C_L = 50$ pF, $R_L = 600$ $\Omega$ ,<br>$f_{in} = 1$ MHz (see Figure 11)  | 42    | dB   |
| Amplitude distortion rate, A to B or B to A                                                | $C_L = 50$ pF, $R_L = 10$ k $\Omega$ ,<br>$f_{in} = 1$ kHz (see Figure 12) | 0.05% |      |

(1) Adjust the input amplitude for output = 0 dBm at  $f = 1$  MHz. Input signal must be a sine wave.

(2) Adjust the input amplitude for output = 0 dBm at  $f = 1$  MHz. Input signal must be a sine wave.

## 6.8 Typical Characteristics



**Figure 1.  $t_{PLH}$  vs  $V_{CC}$**

## 7 Parameter Measurement Information

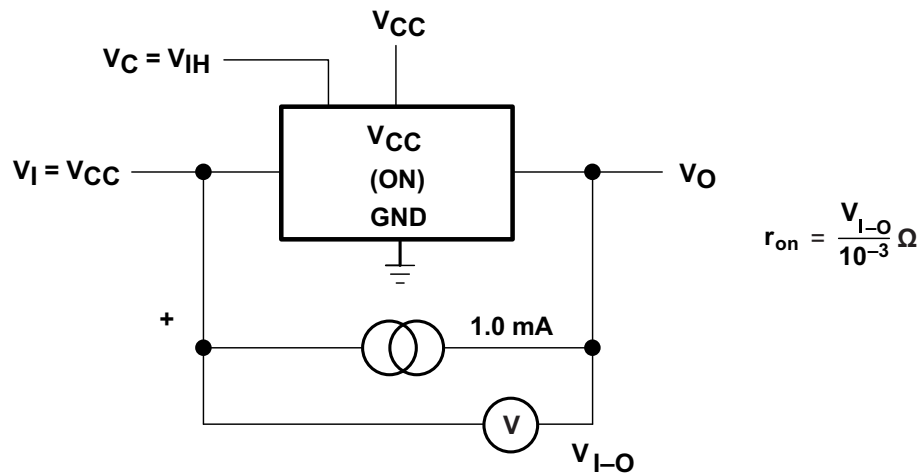
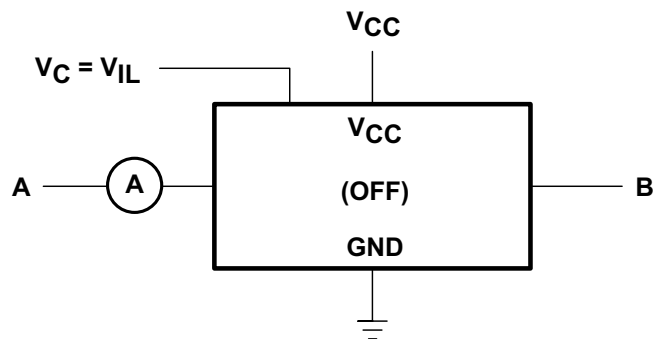


Figure 2. ON-State Resistance Test Circuit



$$V_S = V_A - V_B$$

CONDITION 1:  $V_A = 0$ ,  $V_B = V_{CC}$

CONDITION 2:  $V_A = V_{CC}$ ,  $V_B = 0$

Figure 3. OFF-State Switch Leakage-Current Test Circuit

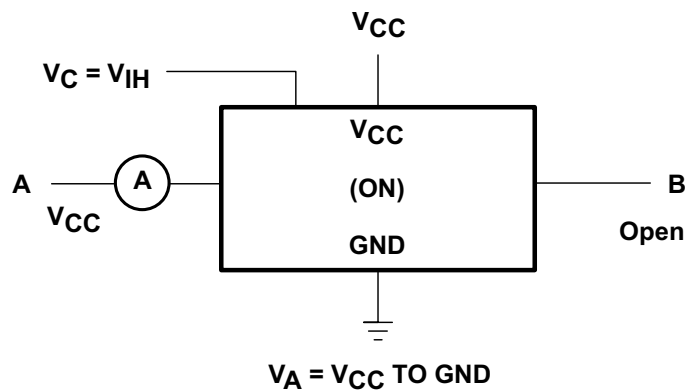
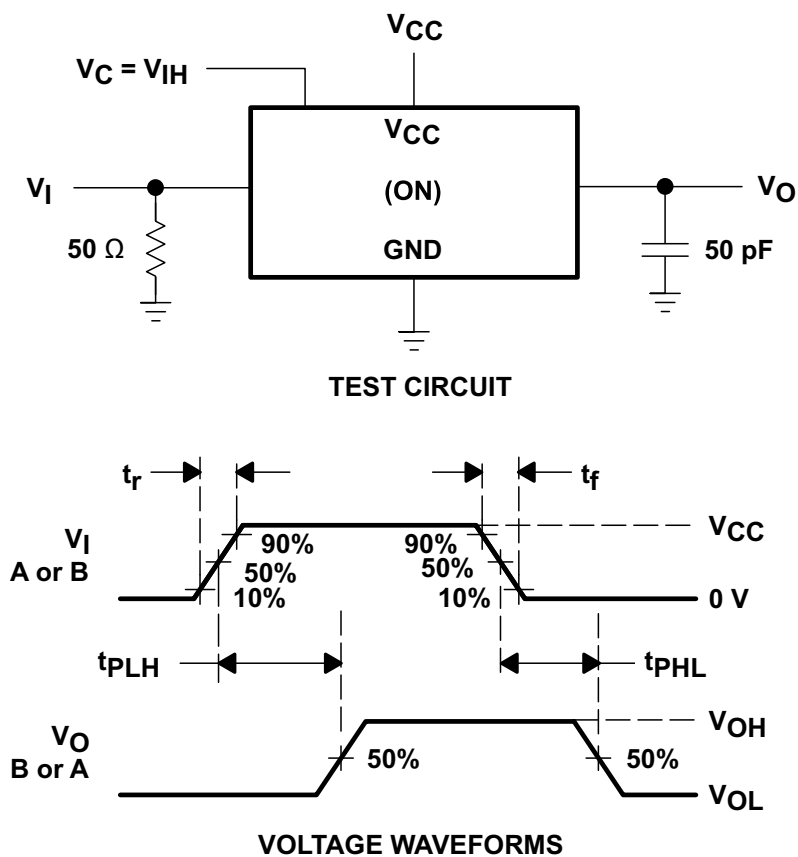
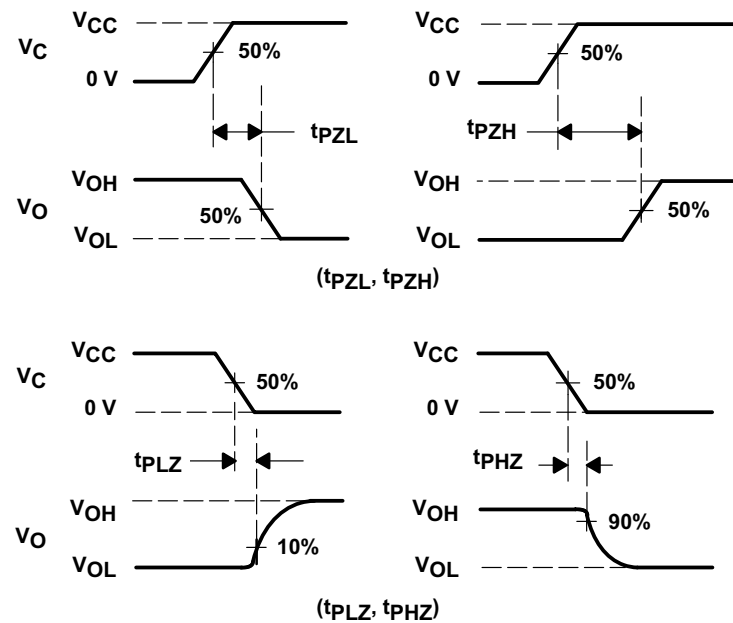
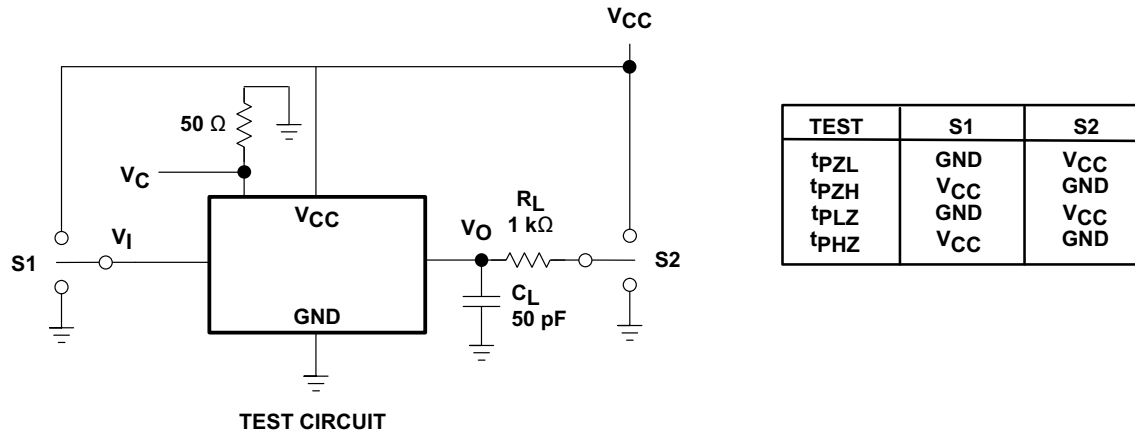
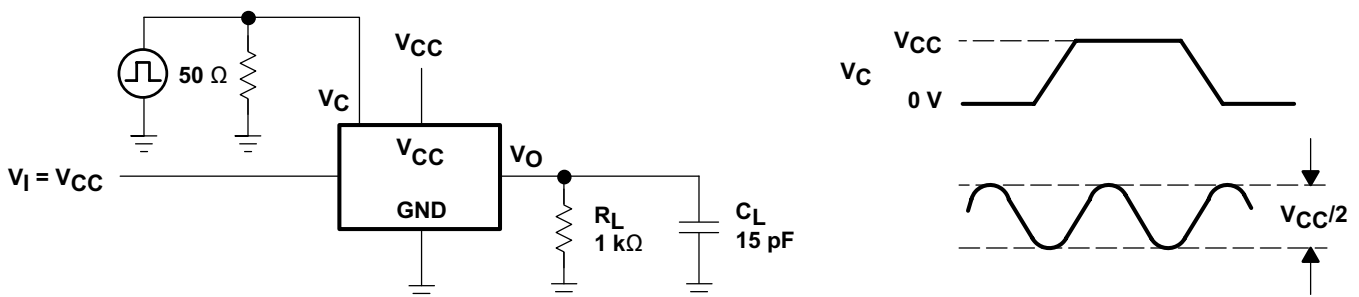


Figure 4. ON-State Leakage-Current Test Circuit

**Parameter Measurement Information (continued)**



**Figure 5. Propagation Delay Time, Signal Input to Signal Output**

**Parameter Measurement Information (continued)**

**VOLTAGE WAVEFORMS**
**Figure 6. Switching Time ( $t_{PZL}$ ,  $t_{PLZ}$ ,  $t_{PZH}$ ,  $t_{PHZ}$ ), Control to Signal Output**

**Figure 7. Control-Input Frequency**

## Parameter Measurement Information (continued)

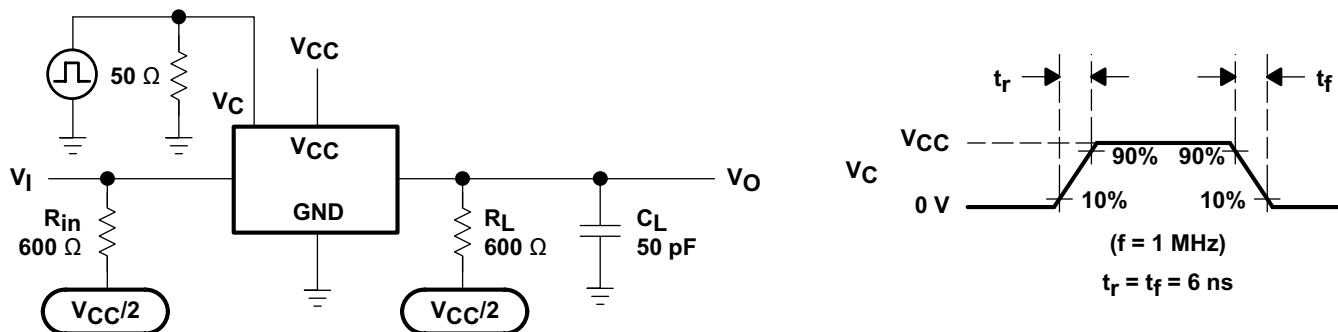


Figure 8. Control Feed-Through Noise

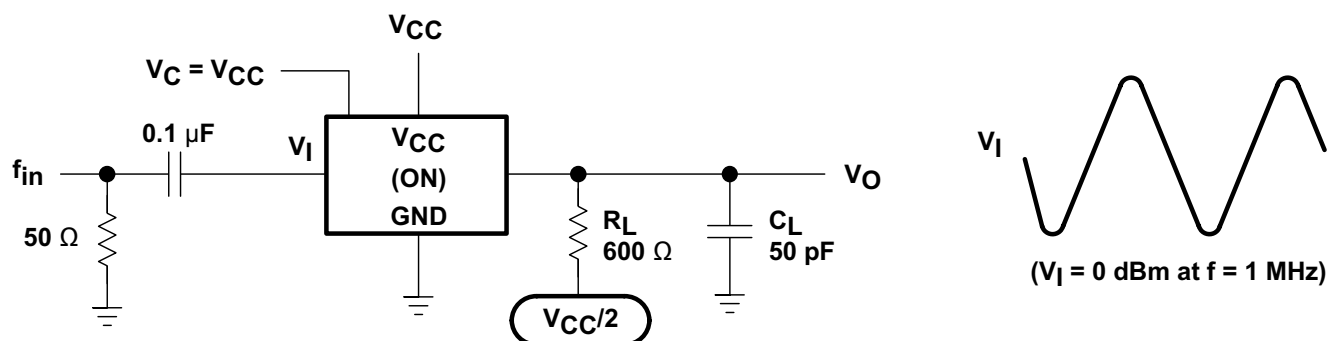


Figure 9. Minimum Through Bandwidth

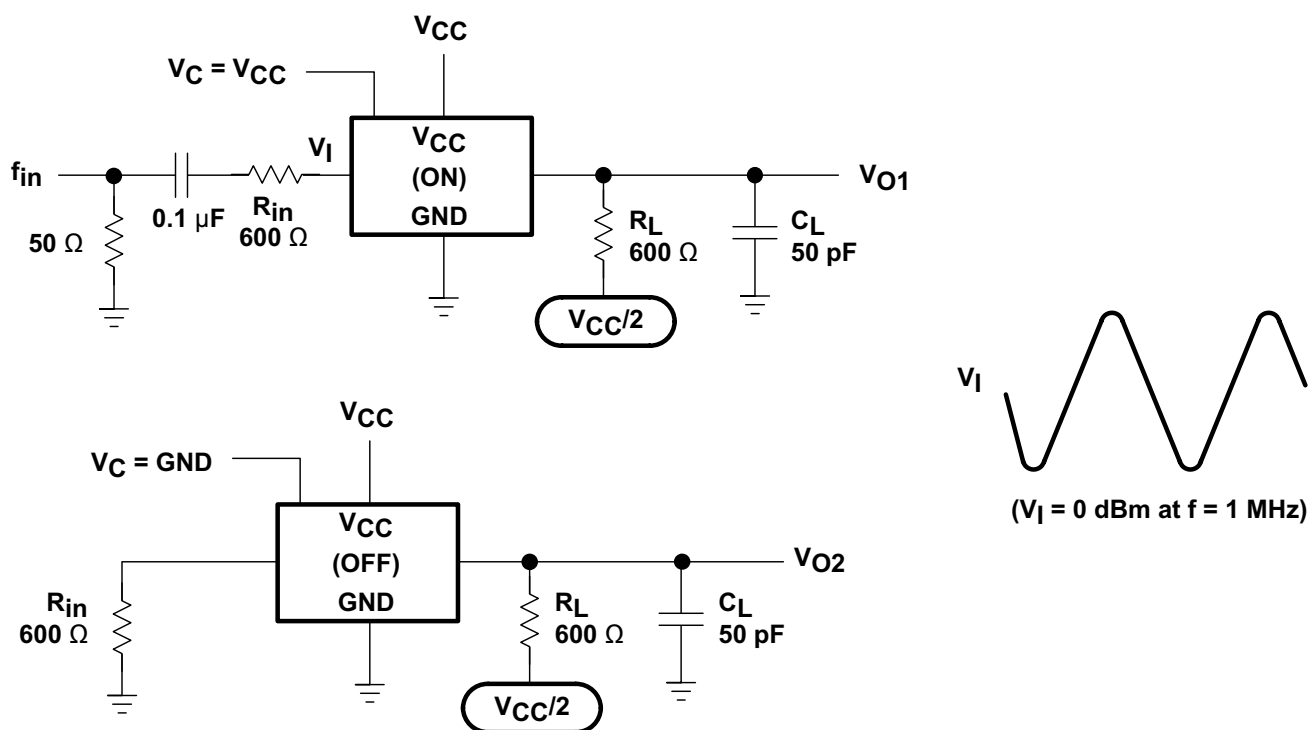
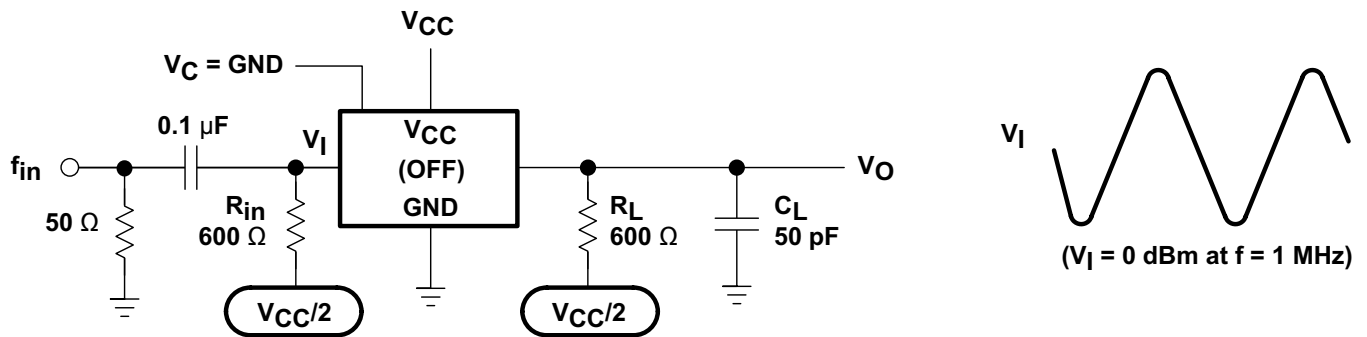
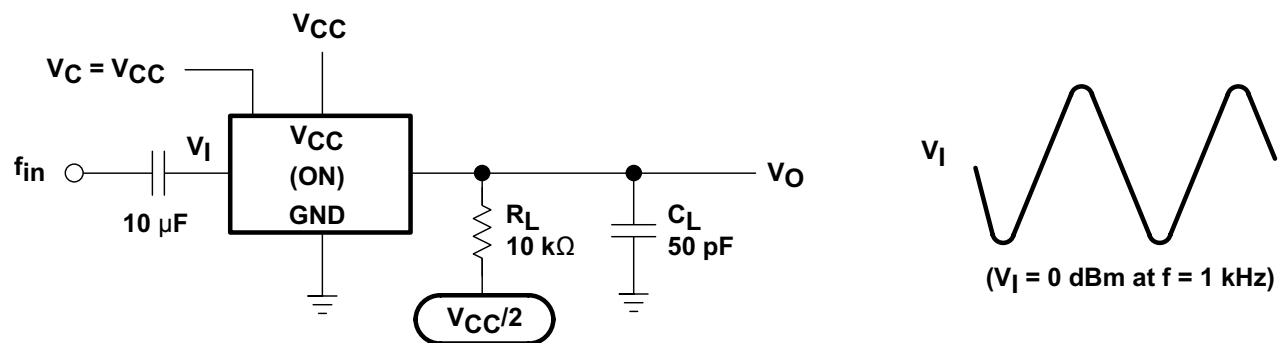


Figure 10. Crosstalk Between Any Two Switches

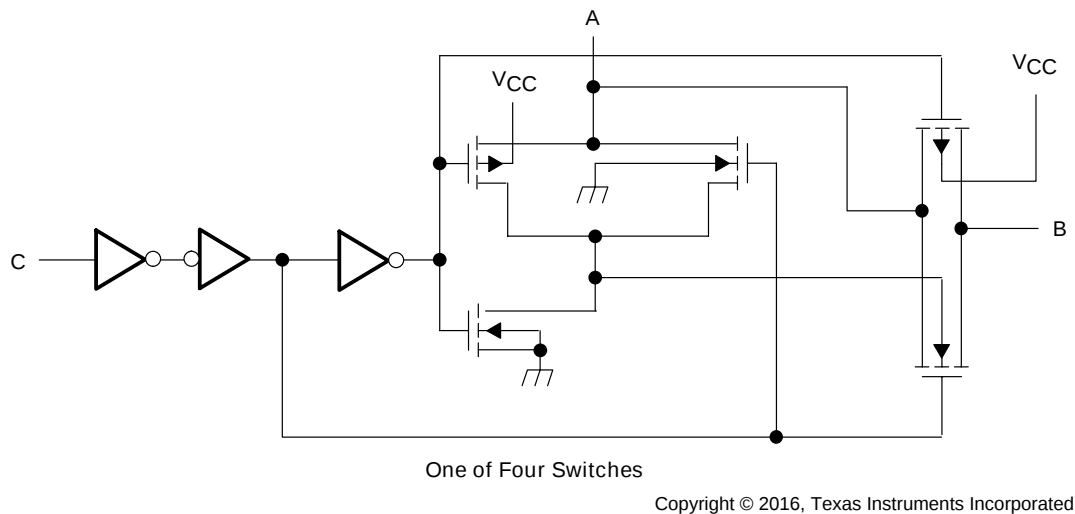
**Parameter Measurement Information (continued)**

**Figure 11. Feed Through, Switch OFF**

**Figure 12. Amplitude-Distortion Rate**

## 8 Detailed Description

### 8.1 Overview

The SN74HC4066 device is a silicon-gate CMOS quadruple analog switch designed for 2-V to 6-V VCC operation. It is designed to handle both analog and digital signals. Each switch permits signals with amplitudes of up to 6 V (peak) to be transmitted in either direction. A high-level voltage applied to the control pin C enables the respective switch to begin propagating signals across the device.

### 8.2 Functional Block Diagram



**Figure 13. Logic Diagram, Each Switch (Positive Logic)**

### 8.3 Feature Description

Each switch section has its own enable-input control (C). A high-level voltage applied to C turns on the associated switch section, with typically 18 ns of switch enable time. The SN74HC4066 has a wide operating voltage range of 2 V to 6 V. It has low power consumption, with 20-μA maximum  $I_{CC}$  and a low on-state impedance of 50 Ω. It also has low crosstalk between switches to minimize noise.

### 8.4 Device Functional Modes

Table 1 lists the functions for the SN74HC4066 device.

**Table 1. Function Table (Each Switch)**

| INPUT CONTROL (C) | SWITCH |
|-------------------|--------|
| L                 | OFF    |
| H                 | ON     |

## 9 Application and Implementation

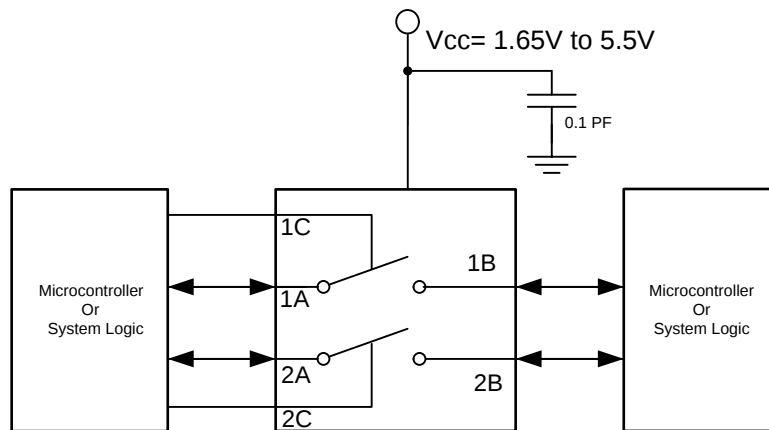
### NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

### 9.1 Application Information

The SN74HC4066 can be used in any situation where an dual SPST switch would be used and a solid-state, voltage controlled version is preferred.

### 9.2 Typical Application



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**Figure 14.**  $t_{PZH}$  vs  $V_{CC}$

#### 9.2.1 Design Requirements

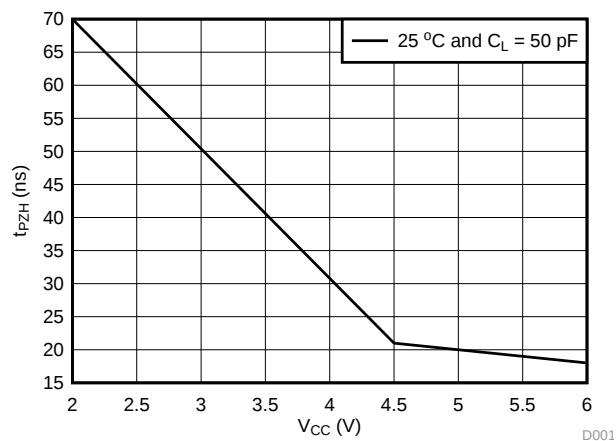
The SN74HC4066 allows ON/OFF control of analog and digital signals with a digital control signal. All input signals should remain between 0 V and  $V_{CC}$  for optimal operation.

#### 9.2.2 Detailed Design Procedure

1. Recommended Input Conditions:
  - For rise time and fall time specifications, see  $\Delta t/\Delta v$  in [Recommended Operating Conditions](#).
  - For specified high and low levels, see  $V_{IH}$  and  $V_{IL}$  in [Recommended Operating Conditions](#).
2. Recommended Output Conditions:
  - On-state switch current should not exceed  $\pm 25$  mA.

## Typical Application (continued)

### 9.2.3 Application Curve



**Figure 15.  $t_{PZH}$  vs  $V_{CC}$**

## 10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the [Recommended Operating Conditions](#).

Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1- $\mu\text{F}$  bypass capacitor. If there are multiple pins labeled  $V_{CC}$ , then a 0.01- $\mu\text{F}$  or 0.022- $\mu\text{F}$  capacitor is recommended for each  $V_{CC}$  because the VCC pins will be tied together internally. For devices with dual-supply pins operating at different voltages, for example  $V_{CC}$  and  $V_{DD}$ , TI recommends a 0.1- $\mu\text{F}$  bypass capacitor for each supply pin. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. 0.1- $\mu\text{F}$  and 1- $\mu\text{F}$  capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

## 11 Layout

### 11.1 Layout Guidelines

Reflections and matching are closely related to loop antenna theory, but different enough to warrant their own discussion. When a PCB trace turns a corner at a 90° angle, a reflection can occur. This is primarily due to the change of width of the trace. At the apex of the turn, the trace width is increased to 1.414 times its width. This upsets the transmission line characteristics, especially the distributed capacitance and self-inductance of the trace — resulting in the reflection.

#### NOTE

Not all PCB traces can be straight, and so they will have to turn corners. [Figure 16](#) shows progressively better techniques of rounding corners. Only the last example maintains constant trace width and minimizes reflections.

### 11.2 Layout Example

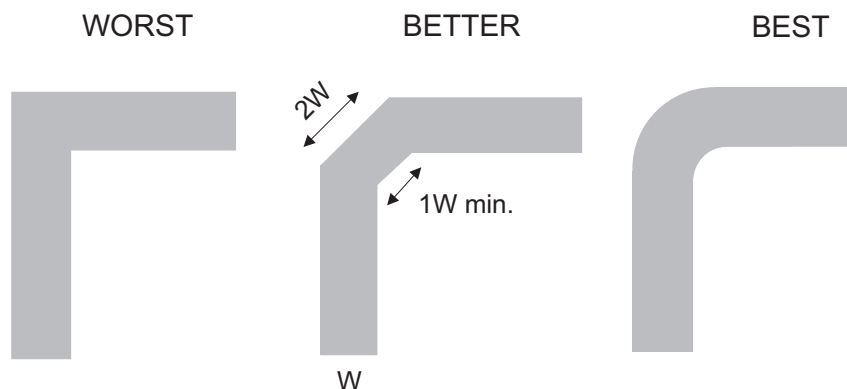


Figure 16. Trace Example

## 12 Device and Documentation Support

### 12.1 Documentation Support

#### 12.1.1 Related Documentation

For related documentation see the following:

[Implications of Slow or Floating CMOS Inputs](#) (SCBA004)

### 12.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 12.3 Community Resource

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

**TI E2E™ Online Community** *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

**Design Support** *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

### 12.4 Trademarks

E2E is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.

### 12.5 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

### 12.6 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74HC4066D      | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066DBR    | ACTIVE        | SSOP         | DB                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066DR     | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066DRE4   | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066DRG4   | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066DT     | ACTIVE        | SOIC         | D                  | 14   | 250            | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066N      | ACTIVE        | PDIP         | N                  | 14   | 25             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | N / A for Pkg Type   | -40 to 85    | SN74HC4066N             | <a href="#">Samples</a> |
| SN74HC4066NSR    | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066PW     | ACTIVE        | TSSOP        | PW                 | 14   | 90             | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066PWR    | ACTIVE        | TSSOP        | PW                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066PWRG4  | ACTIVE        | TSSOP        | PW                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |
| SN74HC4066PWT    | ACTIVE        | TSSOP        | PW                 | 14   | 250            | Green (RoHS<br>& no Sb/Br) | NIPDAU                  | Level-1-260C-UNLIM   | -40 to 85    | HC4066                  | <a href="#">Samples</a> |

(1) 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.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

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**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of  $\leq 1000$ ppm threshold. Antimony trioxide based flame retardants must also meet the  $\leq 1000$ ppm threshold requirement.

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

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

<sup>(6)</sup> Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74HC4066DR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74HC4066DT  | SOIC         | D               | 14   | 250  | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74HC4066NSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74HC4066PWR | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74HC4066PWT | TSSOP        | PW              | 14   | 250  | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74HC4066DR  | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| SN74HC4066DT  | SOIC         | D               | 14   | 250  | 210.0       | 185.0      | 35.0        |
| SN74HC4066NSR | SO           | NS              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| SN74HC4066PWR | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74HC4066PWT | TSSOP        | PW              | 14   | 250  | 367.0       | 367.0      | 35.0        |

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



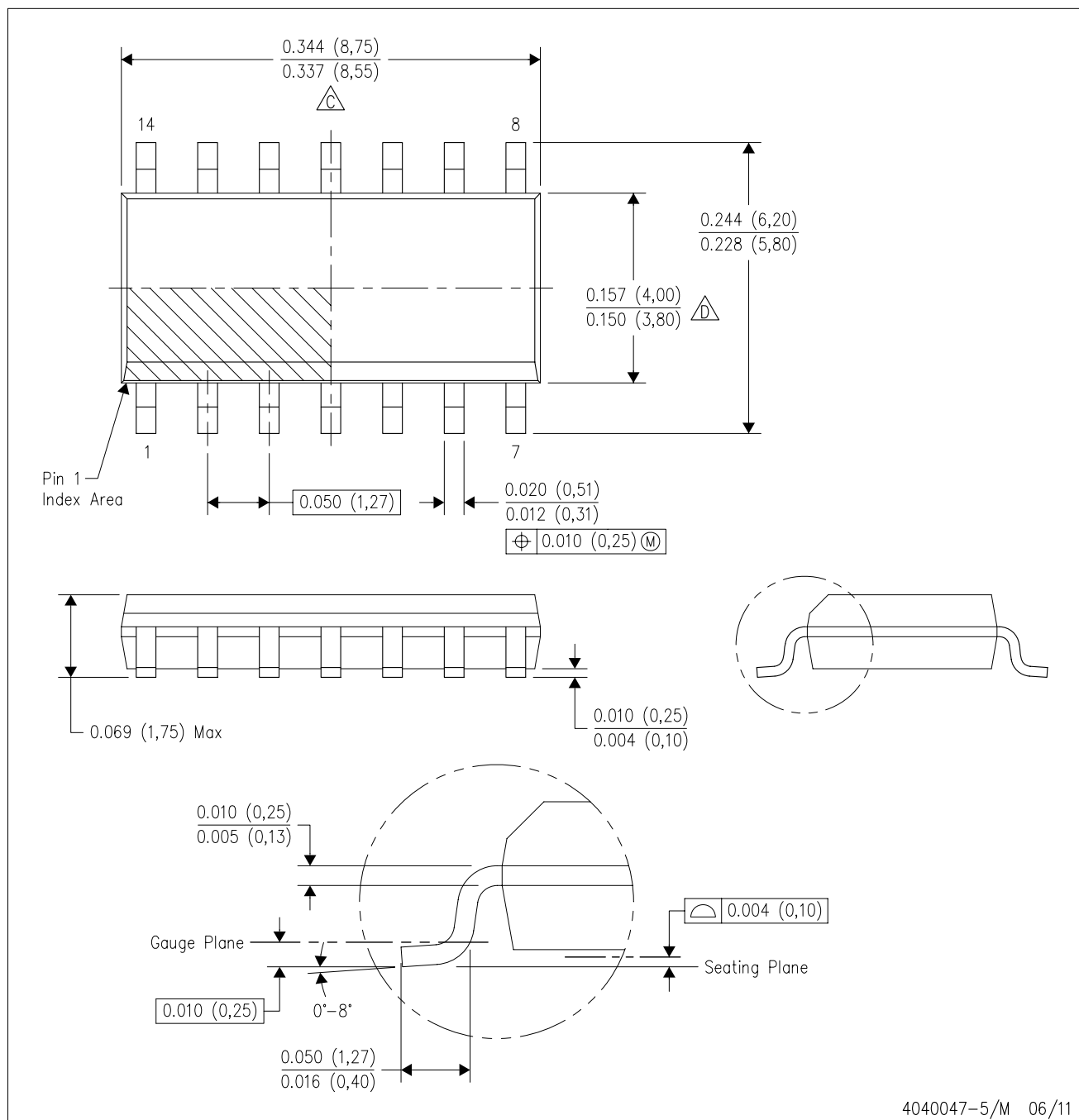
| DIM \ PINS ** | 14    | 16    | 20    | 24    |
|---------------|-------|-------|-------|-------|
| A MAX         | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN         | 9,90  | 9,90  | 12,30 | 14,70 |

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.

## D (R-PDSO-G14)

## PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  -  C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  -  D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

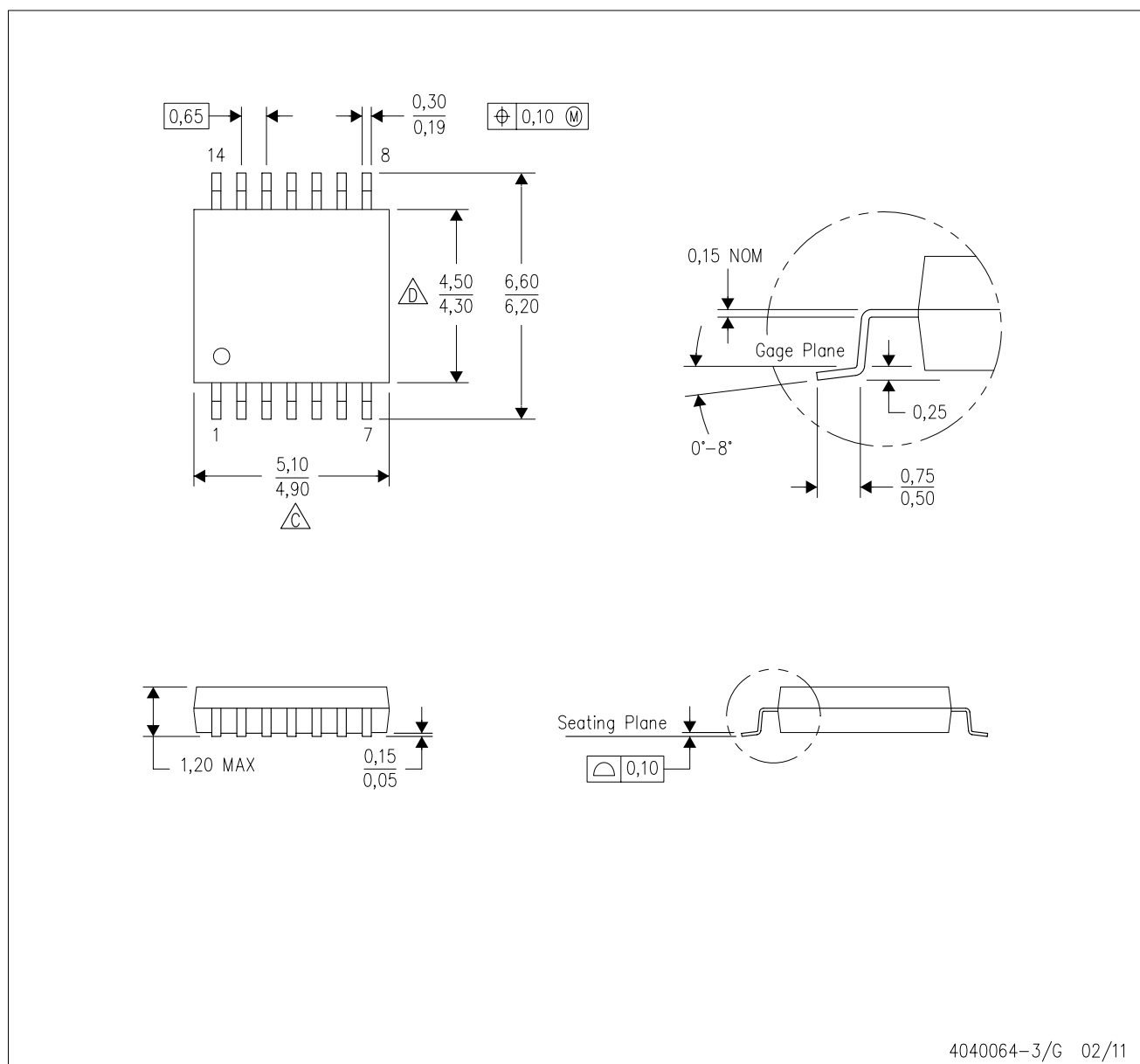
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

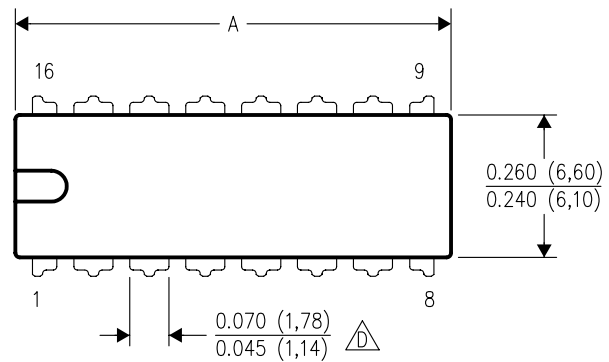


- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

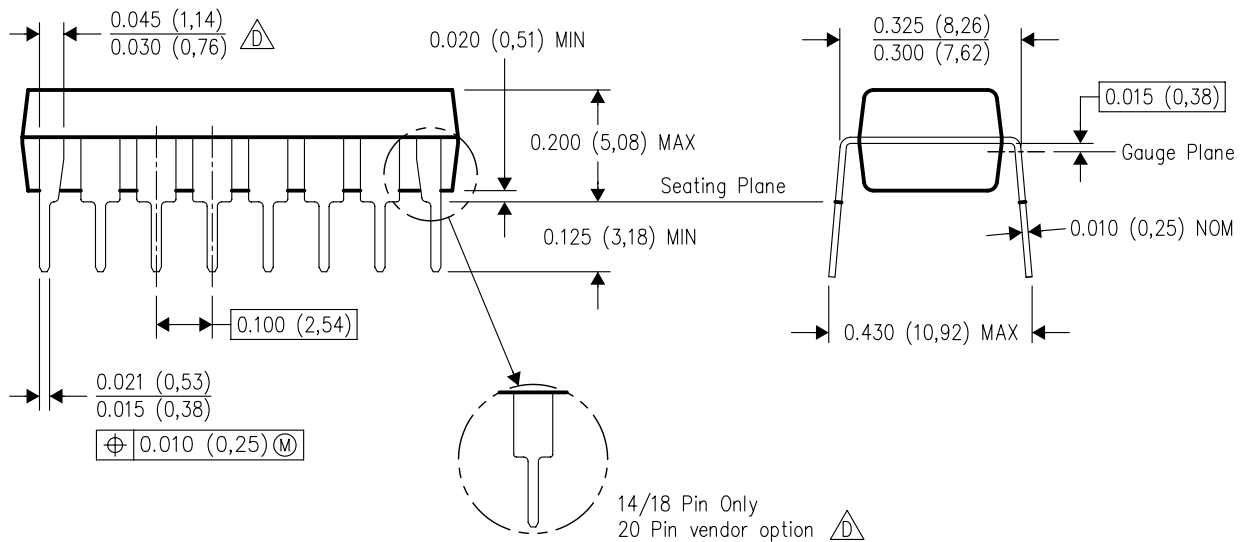
N (R-PDIP-T\*\*)

16 PINS SHOWN

# PLASTIC DUAL-IN-LINE PACKAGE



| DIM \ PINS **       | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



4040049/E 12/2002

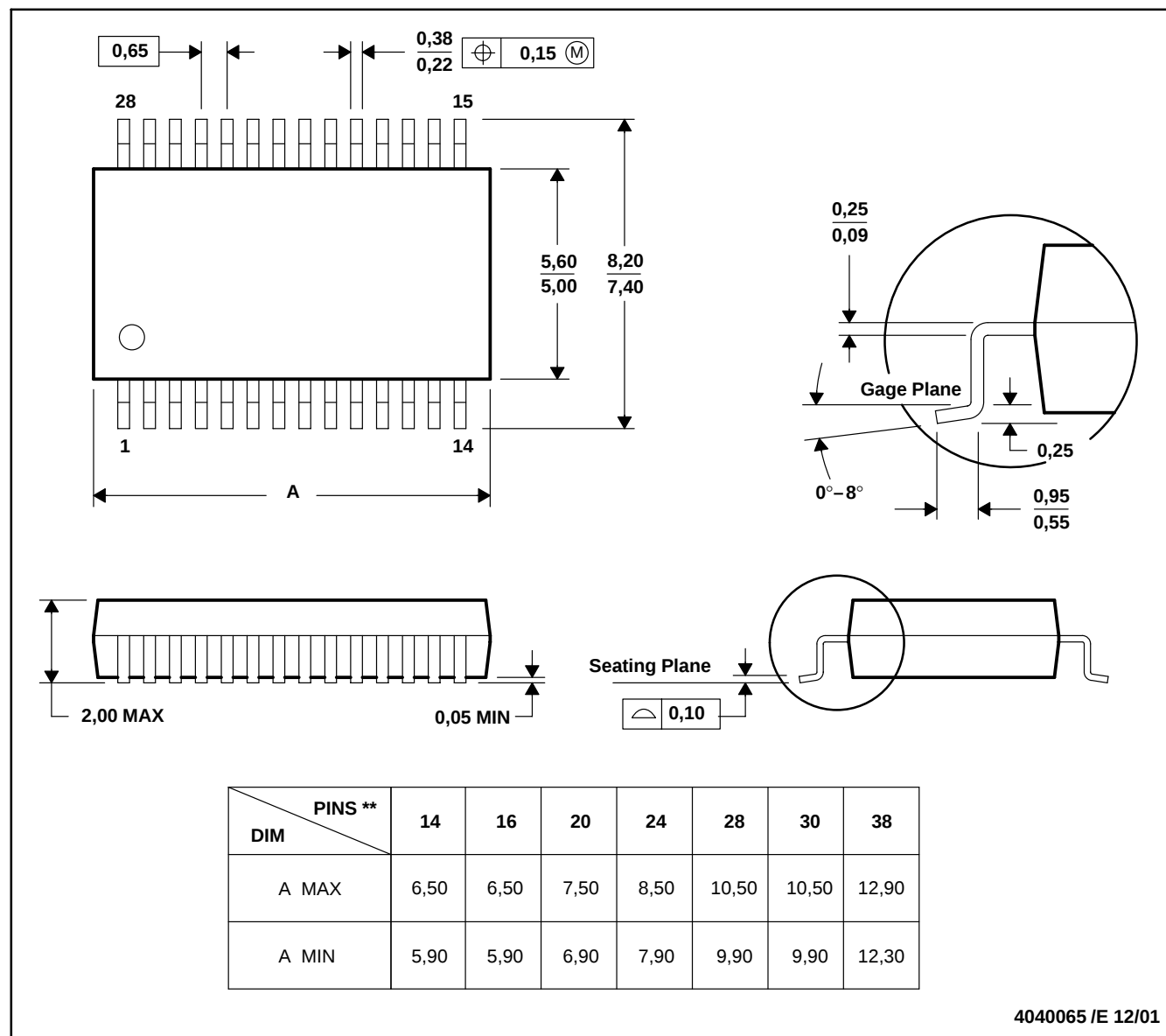
NOTES:

- 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.

## 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

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