

# CDx4HCx4316 High-Speed CMOS Logic Quad Analog Switch with Level Translation

## 1 Features

- Wide analog-input-voltage range:  
 $V_{CC} - V_{EE}$ : 0V to 10V
- Low ON resistance:
  - 45Ω (typical):  $V_{CC} = 4.5V$
  - 35Ω (typical):  $V_{CC} = 6V$
  - 30Ω (typical):  $V_{CC} - V_{EE} = 9V$
- Fast switching and propagation delay times
- Low OFF leakage current
- Built-in break-before-make switching
- Logic-level translation to enable 5V logic to accommodate ±5 V analog signals
- Wide operating temperature range: -55°C to 125°C
- HC types:
  - 2V to 10V operation
  - High noise immunity:  $N_{IL} = 30\%$ ,  $N_{IH} = 30\%$  of  $V_{CC}$  at  $V_{CC} = 5V$
- HCT types:
  - Direct LSTTL input logic compatibility,  $V_{IL} = 0.8V$  (maximum),  $V_{IH} = 2V$  (minimum)
  - CMOS input compatibility,  $I_I \leq 1 \mu A$  at  $V_{OL}$ ,  $V_{OH}$

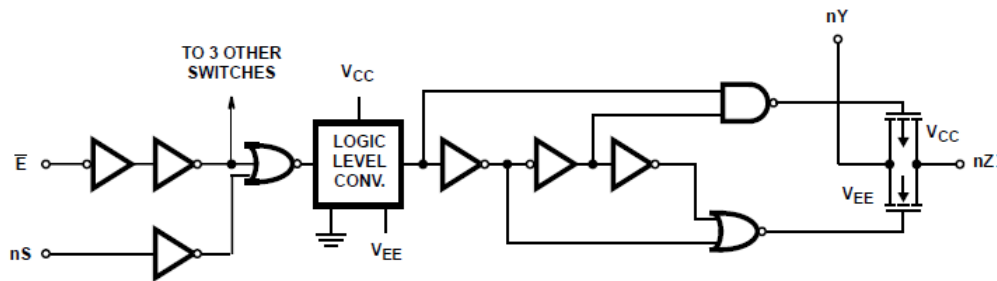
## 2 Description

The 'HC4316 and CD74HCT4316 contain four independent digitally controlled analog switches that use silicon-gate CMOS technology to achieve operating speeds similar to LSTTL with the low power consumption of standard CMOS integrated circuits.

In addition these devices contain logic-level translation circuits that provide for analog signal switching of voltages between ±5V via 5V logic. Each switch is turned on by a high-level voltage on its select input (S) when the common Enable (E) is Low. A High E disables all switches. The digital inputs can swing between  $V_{CC}$  and GND; the analog inputs/outputs can swing between  $V_{CC}$  as a positive limit and  $V_{EE}$  as a negative limit. Voltage ranges are shown in [Figure 13-1](#) and [Figure 13-2](#).

### Device Information

| Inputs |   | Switch |
|--------|---|--------|
| E      | S | ON/OFF |
| L      | L | OFF    |
| L      | H | ON     |
| H      | H | OFF    |



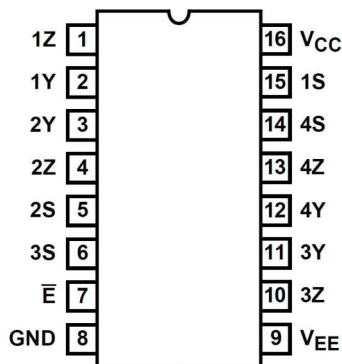
One Switch



## Table of Contents

|  |           |  |           |
|--|-----------|--|-----------|
| <b>1 Features</b> .....  | <b>1</b>  | <b>14 Typical Performance Curves</b> .....                               | <b>16</b> |
| <b>2 Description</b> .....   | <b>1</b>  | <b>15 Parameter Measurement Information</b> .....                        | <b>17</b> |
| <b>3 Pin Configurations and Functions</b> .....                                    | <b>3</b>  | <b>16 Detailed Description</b> .....                                     | <b>18</b> |
| <b>4 Absolute Maximum Ratings</b> .....  | <b>4</b>  | 16.1 Functional Block Diagram.....                                       | 18        |
| <b>5 Thermal Information</b> .....   | <b>5</b>  | 16.2 Device Functional Modes.....  | 18        |
| <b>6 Recommended Operating Conditions</b> .....                                    | <b>5</b>  | <b>17 Device and Documentation Support</b> .....                         | <b>19</b> |
| <b>7 Electrical Characteristics: HC Devices</b> .....                              | <b>6</b>  | 17.1 Receiving Notification of Documentation Updates..                   | 19        |
| <b>8 Electrical Characteristics: HCT Devices</b> .....                             | <b>9</b>  | 17.2 Support Resources.....  | 19        |
| <b>9 Switching Characteristics HC</b> .....  | <b>10</b> | 17.3 Trademarks.....   | 19        |
| <b>10 Switching Characteristics HCT</b> .....                                      | <b>13</b> | 17.4 Electrostatic Discharge Caution.....                                | 19        |
| <b>11 Analog Channel Specifications</b> .....                                      | <b>15</b> | 17.5 Glossary.....   | 19        |
| <b>12 HCT Input Loading Table</b> .....  | <b>15</b> | <b>18 Revision History</b> .....   | <b>19</b> |
| <b>13 Recommended Operating Area as a Function of<br/>    Supply Voltage</b> ..... | <b>15</b> | <b>19 Mechanical, Packaging, and Orderable<br/>    Information</b> ..... | <b>19</b> |

## 3 Pin Configurations and Functions



**Figure 3-1. CD74HC4316 (TSSOP)**

**Table 3-1. Pin Functions**

| PIN             |     | TYPE | DESCRIPTION               |
|-----------------|-----|------|---------------------------|
| NAME            | NO. |      |                           |
| 1Z              | 1   | I/O  | Input/Output for Switch 1 |
| 1Y              | 2   | I/O  | Input/Output for Switch 1 |
| 2Y              | 3   | I/O  | Input/Output for Switch 2 |
| 2Z              | 4   | I/O  | Input/Output for Switch 2 |
| 2S              | 5   | I    | Control pin for Switch 2  |
| 3S              | 6   | I    | Control pin for Switch 3  |
| E               | 7   | I    | Enable Pin                |
| GND             | 8   | -    | Ground Pin                |
| V <sub>EE</sub> | 9   | -    | Power Pin                 |
| 3Z              | 10  | I/O  | Input/Output for Switch 3 |
| 3Y              | 11  | I/O  | Input/Output for Switch 3 |
| 4Y              | 12  | I/O  | Input/Output for Switch 4 |
| 4Z              | 13  | I/O  | Input/Output for Switch 4 |
| 4S              | 14  | I    | Control pin for Switch 4  |
| 1S              | 15  | I    | Control pin for Switch 1  |
| V <sub>CC</sub> | 16  | -    | Power Pin                 |

## 4 Absolute Maximum Ratings

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

|                   |   |  | MIN  | MAX  | UNIT |
|-------------------|---|--|------|------|------|
| $V_{CC} - V_{EE}$ | DC Supply voltage                               |  | -0.5 | 10.5 | V    |
| $V_{CC}$          |   |  | -0.5 | 7    | V    |
| $V_{EE}$          |   |  | 0.5  | -7   | V    |
| $I_{IK}$          | DC input diode current                          | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$         | -20  | 20   | mA   |
| $I_{OK}$          | DC switch diode current                         | $V_I < V_{EE} - 0.5\text{ V}$ or $V_I < V_{CC} + 0.5\text{ V}$ | -25  | 25   | mA   |
| $I_{OK}$          | DC Output Diode Current                         | For $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$     | -20  | 20   | mA   |
| $I_O$             | DC Output Source or Sink Current per Output Pin | For $V_O > -0.5\text{ V}$ or $V_O < V_{CC} + 0.5\text{ V}$     | -25  | 25   | mA   |
| $I_{CC}$          | DC $V_{CC}$ or ground current                   |  | -50  | 50   | mA   |
| $T_{JMAX}$        | Maximum junction temperature                    |  |      | 150  | °C   |
| $T_{LMAX}$        | Maximum lead temperature                        | Soldering 10 s   |      | 300  | °C   |
| $T_{stg}$         | Storage temperature                             |  | -65  | 150  | °C   |

- (1) Stresses beyond those listed under *Absolute Maximum Rating* 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 Condition*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## 5 Thermal Information

| THERMAL METRIC <sup>(1)</sup> |  | PW (TSSOP) | UNIT |
|-------------------------------|--|------------|------|
|                               |  | 16 PINS    |      |
| $R_{\theta JA}$               | Junction-to-ambient thermal resistance | 127.9      | °C/W |

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

## 6 Recommended Operating Conditions

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

|                                  |   |   | MIN      | NOM | MAX      | UNIT |
|----------------------------------|---|---|----------|-----|----------|------|
| $V_{CC}$                         | Supply voltage range ( $T_A$ = full package temperature range)(2) | CD54 and 74HC types                       | 2        |     | 6        | V    |
|                                  |   | CD54 and 74HCT types                      | 4.5      |     | 5.5      |      |
| $V_{CC} - V_{EE}$ <sup>(1)</sup> | Supply voltage range ( $T_A$ = full package temperature range)(2) | CD54 and 74HC types, CD54 and 74HCT types | 2        |     | 10       | V    |
| $V_{EE}$                         | Supply voltage range ( $T_A$ = full package temperature range)(3) | CD54 and 74HC types, CD54 and 74HCT types | 0        |     | –6       | V    |
| $V_I$                            | DC input control voltage  |   | GND      |     | $V_{CC}$ | V    |
| $V_{IS}$                         | Analog switch I/O voltage   |   | $V_{EE}$ |     | $V_{CC}$ | V    |
| $T_A$                            | Ambient temperature   |   | –55      |     | 125      | °C   |
| $t_r, t_f$                       | Input rise and fall times   | 2 V                                       | 0        |     | 1000     | ns   |
|                                  |   | 4.5 V                                     | 0        |     | 500      |      |
|                                  |   | 6 V                                       | 0        |     | 400      |      |

(1)  $V_{DD}$  and  $V_{SS}$  can be any value as long as  $3\text{ V} \leq (V_{DD} - V_{SS}) \leq 24\text{ V}$ , and the minimum  $V_{DD}$  is met.

## 7 Electrical Characteristics: HC Devices

Over operating free-air temperature range,  $V_{\text{SUPPLY}} = \pm 5 \text{ V}$ , and  $R_L = 100 \, \Omega$ , (unless otherwise noted)<sup>(1)</sup>

| PARAMETER   | TEST CONDITIONS     |                    |                     |                     |                 | MIN  | TYP | MAX  | UNIT |  |
|---|---------------------|--------------------|---------------------|---------------------|-----------------|------|-----|------|------|--|
| SIGNAL INPUTS (V <sub>IS</sub> ) AND OUTPUTS (V <sub>OS</sub> ) |                     |                    |                     |                     |                 |      |     |      |      |  |
|   | V <sub>IS</sub> (V) | V <sub>I</sub> (V) | V <sub>EE</sub> (V) | V <sub>CC</sub> (V) | T <sub>A</sub>  |      |     |      |      |  |
| Input High Voltage, V <sub>IH</sub> , Min                       |                     |                    |                     | 2                   | 25°C            |      |     | 1.5  | V    |  |
|   |                     |                    |                     |                     | −40°C to +85°C  |      |     | 1.5  |      |  |
|   |                     |                    |                     |                     | −55°C to +125°C |      |     | 1.5  |      |  |
|   |                     |                    |                     | 4.5                 | 25°C            |      |     | 3.15 |      |  |
|   |                     |                    |                     |                     | −40°C to +85°C  |      |     | 3.15 |      |  |
|   |                     |                    |                     |                     | −55°C to +125°C |      |     | 3.15 |      |  |
|   |                     |                    |                     | 6                   | 25°C            |      |     | 4.2  |      |  |
|   |                     |                    |                     |                     | −40°C to +85°C  |      |     | 4.2  |      |  |
|   |                     |                    |                     |                     | −55°C to +125°C |      |     | 4.2  |      |  |
| Input Low Voltage, V <sub>IL</sub> , Max                        |                     |                    |                     | 2                   | 25°C            | 0.5  |     |      | V    |  |
|   |                     |                    |                     |                     | −40°C to +85°C  | 0.5  |     |      |      |  |
|   |                     |                    |                     |                     | −55°C to +125°C | 0.5  |     |      |      |  |
|   |                     |                    |                     | 4.5                 | 25°C            | 1.35 |     |      |      |  |
|   |                     |                    |                     |                     | −40°C to +85°C  | 1.35 |     |      |      |  |
|   |                     |                    |                     |                     | −55°C to +125°C | 1.35 |     |      |      |  |
|   |                     |                    |                     | 6                   | 25°C            | 1.8  |     |      |      |  |
|   |                     |                    |                     |                     | −40°C to +85°C  | 1.8  |     |      |      |  |
|   |                     |                    |                     |                     | −55°C to +125°C | 1.8  |     |      |      |  |

Over operating free-air temperature range,  $V_{\text{SUPPLY}} = \pm 5 \text{ V}$ , and  $R_L = 100 \Omega$ , (unless otherwise noted)<sup>(1)</sup>

| PARAMETER  | TEST CONDITIONS                    |   |      |                |                 | MIN | TYP | MAX       | UNIT          |
|--|------------------------------------|---|------|----------------|-----------------|-----|-----|-----------|---------------|
| $r_{\text{ON}}$<br>ON resistance<br>$I_O = 1 \text{ mA}$                 | $V_{\text{CC}}$ or $V_{\text{EE}}$ | $V_{\text{IH}}$ or $V_{\text{IL}}$                        | 0    | 4.5            | 25°C            |     | 30  | 180       | $\Omega$      |
|  |                                    |   |      |                | –40°C to +85°C  |     |     | 225       |               |
|  |                                    |   |      |                | –55°C to +125°C |     |     | 270       |               |
|  |                                    |   | 0    | 6              | 25°C            |     | 35  | 160       |               |
|  |                                    |   |      |                | –40°C to +85°C  |     |     | 200       |               |
|  |                                    |   |      |                | –55°C to +125°C |     |     | 240       |               |
|  | $V_{\text{CC}}$ to $V_{\text{EE}}$ | $V_{\text{IH}}$ or $V_{\text{IL}}$                        | –4.5 | 4.5            | 25°C            |     | 30  | 135       | $\Omega$      |
|  |                                    |   |      |                | –40°C to +85°C  |     |     | 170       |               |
|  |                                    |   |      |                | –55°C to +125°C |     |     | 205       |               |
|  |                                    |   | 0    | 4.5            | 25°C            |     | 40  | 320       |               |
|  |                                    |   |      |                | –40°C to +85°C  |     |     | 400       |               |
|  |                                    |   |      |                | –55°C to +125°C |     |     | 480       |               |
| $\Delta r_{\text{ON}}$<br>Maximum ON resistance between any two channels |                                    |   | 0    | 6              | 25°C            |     | 30  | 240       | $\Omega$      |
|  |                                    |   |      |                | –40°C to +85°C  |     |     | 300       |               |
|  |                                    |   |      |                | –55°C to +125°C |     |     | 360       |               |
| $I_{\text{IZ}}$<br>Switch OFF leakage current                            | $V_{\text{CC}} - V_{\text{EE}}$    | $V_{\text{IH}}$ or $V_{\text{IL}}$<br>$E = V_{\text{CC}}$ | 0    | 6              | 25°C            |     |     | $\pm 0.1$ | $\mu\text{A}$ |
|  |                                    |   |      |                | –55°C to 85°C   |     |     | $\pm 1$   |               |
|  |                                    |   | 0    | 6              | –55°C to 125°C  |     |     | $\pm 1$   |               |
|  |                                    |   |      |                | 25°C            |     |     | $\pm 0.1$ |               |
|  |                                    |   | –5   | 5              | –55°C to 85°C   |     |     | $\pm 1$   |               |
|  |                                    |   |      |                | –55°C to 125°C  |     |     | $\pm 1$   |               |
| $I_{\text{IL}}$<br>Control input leakage current                         | $V_{\text{CC}}$ or GND             | 0   | 6    | 25°C           |                 |     |     | $\pm 0.1$ | $\mu\text{A}$ |
|  |                                    |   |      | –55°C to 85°C  |                 |     |     | $\pm 1$   |               |
|  |                                    |   |      | –55°C to 125°C |                 |     |     | $\pm 1$   |               |

Over operating free-air temperature range,  $V_{\text{SUPPLY}} = \pm 5 \text{ V}$ , and  $R_L = 100 \, \Omega$ , (unless otherwise noted)<sup>(1)</sup>

| PARAMETER   |  | TEST CONDITIONS        |    |   |                | MIN | TYP | MAX | UNIT |
|---|--|------------------------|----|---|----------------|-----|-----|-----|------|
| Quiescent Device Current, I <sub>DD</sub> Max<br>I <sub>O</sub> = 1mA | When V <sub>IS</sub> =<br>V <sub>EE</sub> , V <sub>OS</sub> =<br>V <sub>CC</sub> | V <sub>CC</sub> or GND | 0  | 6 | 25°C           |     |     | 14  | μA   |
|   |  |                        |    |   | –55°C to 85°C  |     |     | 80  |      |
|   |  |                        |    |   | –55°C to 125°C |     |     | 160 |      |
|   | When V <sub>IS</sub> =<br>V <sub>CC</sub> , V <sub>OS</sub> =<br>V <sub>EE</sub> | V <sub>CC</sub> or GND | -5 | 5 | 25°C           |     |     | 30  |      |
|   |  |                        |    |   | –55°C to 85°C  |     |     | 160 |      |
|   |  |                        |    |   | –55°C to 125°C |     |     | 320 |      |
| CONTROL (ADDRESS OR INHIBIT), V <sub>C</sub>                          |  |                        |    |   |                |     |     |     |      |

(1) For dual-supply systems theoretical worst case ( $V_I = 2.4 \text{ V}$ ,  $V_{CC} = 5.5 \text{ V}$ ) specification is 1.8mA



## 8 Electrical Characteristics: HCT Devices

Over operating free-air temperature range,  $V_{\text{SUPPLY}} = \pm 5 \text{ V}$ , and  $R_L = 100 \Omega$ , (unless otherwise noted)<sup>(1)</sup>

| PARAMETER   |                  | TEST CONDITIONS                    |                                    |                     |                     |                 | MIN  | TYP | MAX | UNIT |
|---|------------------|------------------------------------|------------------------------------|---------------------|---------------------|-----------------|------|-----|-----|------|
| SIGNAL INPUTS (V <sub>IS</sub> ) AND OUTPUTS (V <sub>OS</sub> ) |                  |                                    |                                    |                     |                     |                 |      |     |     |      |
|   |                  | V <sub>IS</sub> (V)                | V <sub>I</sub> (V)                 | V <sub>CC</sub> (V) | V <sub>EE</sub> (V) | T <sub>A</sub>  |      |     |     |      |
| High Level Input Voltage  | V <sub>IH</sub>  |                                    |                                    | 4.5 to 5.5          |                     | 25°C            | 2    |     | V   |      |
|   |                  |                                    |                                    |                     |                     | –40°C to +85°C  | 2    |     |     |      |
|   |                  |                                    |                                    |                     |                     | –55°C to +125°C | 2    |     |     |      |
| Low Level Input Voltage   | V <sub>IL</sub>  |                                    |                                    |                     |                     | 25°C            | 0.8  |     | V   |      |
|   |                  |                                    |                                    |                     |                     | –40°C to +85°C  | 0.8  |     |     |      |
|   |                  |                                    |                                    |                     |                     | –55°C to +125°C | 0.8  |     |     |      |
| "ON" Resistance IO = 1mA  | R <sub>ON</sub>  | V <sub>CC</sub> or V <sub>EE</sub> | V <sub>IH</sub> or V <sub>IL</sub> | 4.5                 | 0                   | 25°C            | 30   | 180 | Ω   |      |
|   |                  |                                    |                                    |                     |                     | –40°C to +85°C  | 45   | 225 |     |      |
|   |                  |                                    |                                    |                     |                     | –55°C to +125°C | 270  |     |     |      |
|   |                  | V <sub>CC</sub> to V <sub>EE</sub> |                                    | 4.5                 | –4.5                | 25°C            | 135  |     |     |      |
|   |                  |                                    |                                    |                     |                     | –40°C to +85°C  | 30   | 170 |     |      |
|   |                  |                                    |                                    |                     |                     | –55°C to +125°C | 205  |     |     |      |
|   |                  | V <sub>CC</sub> or V <sub>EE</sub> |                                    | 4.5                 | 0                   | 25°C            | 320  |     |     |      |
|   |                  |                                    |                                    |                     |                     | –40°C to +85°C  | 85   | 400 |     |      |
|   |                  |                                    |                                    |                     |                     | –55°C to +125°C | 480  |     |     |      |
|   |                  | V <sub>CC</sub> to V <sub>EE</sub> |                                    | 4.5                 | –4.5                | 25°C            | 35   | 170 |     |      |
|   |                  |                                    |                                    |                     |                     | –40°C to +85°C  | 215  |     |     |      |
|   |                  |                                    |                                    |                     |                     | –55°C to +125°C | 255  |     |     |      |
| "ON" Resistance Between Any Two Switches                        | ▲R <sub>ON</sub> |                                    | V <sub>CC</sub>                    | 4.5                 | 0                   | 25°C            | 10   | Ω   |     |      |
|   |                  |                                    |                                    | 4.5                 | –4.5                | 25°C            | 5    | Ω   |     |      |
| Off-Switch Leakage Current                                      | I <sub>IZ</sub>  | V <sub>CC</sub> - V <sub>EE</sub>  | V <sub>IH</sub> or V <sub>IL</sub> | 6                   | 0                   | 25°C            | ±0.1 |     | μA  |      |
|   |                  |                                    |                                    |                     |                     | –55°C to 85°C   | ±1   |     | μA  |      |
|   |                  |                                    |                                    |                     |                     | –55°C to 125°C  | ±1   |     | μA  |      |
|   |                  |                                    |                                    | 5                   | –5                  | 25°C            | ±0.1 |     | μA  |      |
|   |                  |                                    |                                    |                     |                     | –55°C to 85°C   | ±1   |     |     |      |
|   |                  |                                    |                                    |                     |                     | –55°C to 125°C  | ±1   |     |     |      |
| Input Leakage Current (Any Control)                             | I <sub>IL</sub>  |                                    | V <sub>CC</sub> or GND             | 5.5                 | 0                   | 25°C            | ±0.1 |     | μA  |      |
|   |                  |                                    |                                    |                     |                     | –55°C to 85°C   | ±1   |     |     |      |
|   |                  |                                    |                                    |                     |                     | –55°C to 125°C  | ±1   |     |     |      |

Over operating free-air temperature range,  $V_{\text{SUPPLY}} = \pm 5 \text{ V}$ , and  $R_L = 100 \, \Omega$ , (unless otherwise noted)<sup>(1)</sup>

| PARAMETER  |                       | TEST CONDITIONS   |                                      |     |                |                | MIN | TYP | MAX     | UNIT    |
|--|-----------------------|---|--------------------------------------|-----|----------------|----------------|-----|-----|---------|---------|
| Quiescent Device Current                                       | $I_{CC}$              | When $V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; When $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$ | Any voltage between $V_{CC}$ and GND | 5.5 | 0              | 25°C           |     |     | 8       | $\mu A$ |
|  |                       |   |                                      |     |                | –55°C to 85°C  |     |     | 80      |         |
|  |                       |   |                                      |     |                | –55°C to 125°C |     |     | 160     |         |
|  |                       |   |                                      | 5.5 | –4.5           | 25°C           |     |     | 16      |         |
|  |                       |   |                                      |     |                | –55°C to 85°C  |     |     | 160     |         |
|  |                       |   |                                      |     |                | –55°C to 125°C |     |     | 320     |         |
| Additional Quiescent Device Current Per Input Pin: 1 Unit Load | $\Delta I_{CC}^{(1)}$ | $V_{CC} - 2.1$  | 4.5 to 5.5                           |     | 25°C           |                | 100 | 360 | $\mu A$ |         |
|  |                       |   |                                      |     | –55°C to 85°C  |                |     | 450 |         |         |
|  |                       |   |                                      |     | –55°C to 125°C |                |     | 490 |         |         |
| CONTROL (ADDRESS OR INHIBIT), $V_C$                            |                       |   |                                      |     |                |                |     |     |         |         |

(1) For dual-supply systems theoretical worst case ( $V_{\text{I}} = 2.4 \text{ V}$ ,  $V_{\text{CC}} = 5.5 \text{ V}$ ) specification is 1.8mA

## 9 Switching Characteristics HC

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

| Parameter                           |                                     | VEE (V) | VCC (V) | Test Conditions |                 | MIN | NOM | MAX | UNIT |
|-------------------------------------|-------------------------------------|---------|---------|-----------------|-----------------|-----|-----|-----|------|
| Propagation Delay, Switch In to Out | $t_{\text{PLH}}$ , $t_{\text{PHL}}$ | 0       | 2       | 50pF            | 25°C            |     |     | 60  | ns   |
|                                     |                                     | 0       | 2       |                 | –40°C to +85°C  |     |     | 75  |      |
|                                     |                                     | 0       | 2       |                 | –55°C to +125°C |     |     | 90  |      |
|                                     |                                     | 0       | 4.5     |                 | 25°C            |     |     | 12  |      |
|                                     |                                     | 0       | 4.5     |                 | –40°C to +85°C  |     |     | 15  |      |
|                                     |                                     | 0       | 4.5     |                 | –55°C to +125°C |     |     | 18  |      |
|                                     |                                     | 0       | 6       |                 | 25°C            |     |     | 10  |      |
|                                     |                                     | 0       | 6       |                 | –40°C to +85°C  |     |     | 13  |      |
|                                     |                                     | 0       | 6       |                 | –55°C to +125°C |     |     | 15  |      |
|                                     |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 8   |      |
|                                     |                                     | –4.5    | 4.5     |                 | –40°C to +85°C  |     |     | 10  |      |
|                                     |                                     | –4.5    | 4.5     |                 | –55°C to +125°C |     |     | 12  |      |

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

| Parameter                         |            | VEE (V) | VCC (V) | Test Conditions |                    | MIN | NOM | MAX | UNIT |
|-----------------------------------|------------|---------|---------|-----------------|--------------------|-----|-----|-----|------|
| Turn<br>"ON"<br>Time !E<br>to Out | tPZH, tPZL | 0       | 2       | 50pF            | 25°C               |     |     | 205 | ns   |
|                                   |            | 0       | 2       |                 | –40°C to<br>+85°C  |     |     | 255 |      |
|                                   |            | 0       | 2       |                 | –55°C to<br>+125°C |     |     | 310 |      |
|                                   |            | 0       | 4.5     |                 | 25°C               |     |     | 41  |      |
|                                   |            | 0       | 4.5     |                 | –40°C to<br>+85°C  |     |     | 51  |      |
|                                   |            | 0       | 4.5     |                 | –55°C to<br>+125°C |     |     | 62  |      |
|                                   |            | 0       | 6       |                 | 25°C               |     |     | 35  |      |
|                                   |            | 0       | 6       |                 | –40°C to<br>+85°C  |     |     | 43  |      |
|                                   |            | 0       | 6       |                 | –55°C to<br>+125°C |     |     | 53  |      |
|                                   |            | –4.5    | 4.5     |                 | 25°C               |     |     | 37  |      |
|                                   |            | –4.5    | 4.5     |                 | –40°C to<br>+85°C  |     |     | 47  |      |
|                                   |            | –4.5    | 4.5     |                 | –55°C to<br>+125°C |     |     | 56  |      |
|                                   |            | –       | 5       | 15pF            | 25°C               |     |     | 8   |      |
| Turn<br>"ON"<br>Time nS<br>to Out | tPZH, tPZL | 0       | 2       | 50pF            | 25°C               |     |     | 175 | ns   |
|                                   |            | 0       | 2       |                 | –40°C to<br>+85°C  |     |     | 220 |      |
|                                   |            | 0       | 2       |                 | –55°C to<br>+125°C |     |     | 265 |      |
|                                   |            | 0       | 4.5     |                 | 25°C               |     |     | 35  |      |
|                                   |            | 0       | 4.5     |                 | –40°C to<br>+85°C  |     |     | 44  |      |
|                                   |            | 0       | 4.5     |                 | –55°C to<br>+125°C |     |     | 53  |      |
|                                   |            | 0       | 6       |                 | 25°C               |     |     | 30  |      |
|                                   |            | 0       | 6       |                 | –40°C to<br>+85°C  |     |     | 37  |      |
|                                   |            | 0       | 6       |                 | –55°C to<br>+125°C |     |     | 45  |      |
|                                   |            | –4.5    | 4.5     |                 | 25°C               |     |     | 34  |      |
|                                   |            | –4.5    | 4.5     |                 | –40°C to<br>+85°C  |     |     | 43  |      |
|                                   |            | –4.5    | 4.5     |                 | –55°C to<br>+125°C |     |     | 51  |      |
|                                   |            | –       | 5       | 15pF            | 25°C               |     |     | 14  |      |

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

| Parameter                                       |                                     | VEE (V) | VCC (V) | Test Conditions |                 | MIN | NOM | MAX | UNIT |
|---|-------------------------------------|---------|---------|-----------------|-----------------|-----|-----|-----|------|
| Turn<br>"OFF"<br>Time t <sub>IE</sub><br>to Out | t <sub>PLZ</sub> , t <sub>PHZ</sub> | 0       | 2       | 50pF            | 25°C            |     |     | 205 | ns   |
|   |                                     | 0       | 2       |                 | –40°C to +85°C  |     |     | 255 | ns   |
|   |                                     | 0       | 2       |                 | –55°C to +125°C |     |     | 310 | ns   |
|   |                                     | 0       | 4.5     |                 | 25°C            |     |     | 41  | ns   |
|   |                                     | 0       | 4.5     |                 | –40°C to +85°C  |     |     | 51  | ns   |
|   |                                     | 0       | 4.5     |                 | –55°C to +125°C |     |     | 62  | ns   |
|   |                                     | 0       | 6       |                 | 25°C            |     |     | 35  | ns   |
|   |                                     | 0       | 6       |                 | –40°C to +85°C  |     |     | 43  | ns   |
|   |                                     | 0       | 6       |                 | –55°C to +125°C |     |     | 53  | ns   |
|   |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 37  | ns   |
|   |                                     | –4.5    | 4.5     |                 | –40°C to +85°C  |     |     | 47  | ns   |
|   |                                     | –4.5    | 4.5     |                 | –55°C to +125°C |     |     | 56  | ns   |
|   |                                     | –       | 5       | 15pF            | 25°C            |     |     | 8   | ns   |
| Turn<br>"OFF"<br>Time t <sub>nS</sub><br>to Out | t <sub>PLZ</sub> , t <sub>PHZ</sub> | 0       | 2       | 50pF            | 25°C            |     |     | 175 | ns   |
|   |                                     | 0       | 2       |                 | –40°C to +85°C  |     |     | 220 |      |
|   |                                     | 0       | 2       |                 | –55°C to +125°C |     |     | 265 |      |
|   |                                     | 0       | 4.5     |                 | 25°C            |     |     | 35  |      |
|   |                                     | 0       | 4.5     |                 | –40°C to +85°C  |     |     | 44  |      |
|   |                                     | 0       | 4.5     |                 | –55°C to +125°C |     |     | 53  |      |
|   |                                     | 0       | 6       |                 | 25°C            |     |     | 30  |      |
|   |                                     | 0       | 6       |                 | –40°C to +85°C  |     |     | 37  |      |
|   |                                     | 0       | 6       |                 | –55°C to +125°C |     |     | 45  |      |
|   |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 34  |      |
|   |                                     | –4.5    | 4.5     |                 | –40°C to +85°C  |     |     | 43  |      |
|   |                                     | –4.5    | 4.5     |                 | –55°C to +125°C |     |     | 51  |      |
|   |                                     | –       | 5       | 15pF            | 25°C            |     |     | 14  |      |

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

| Parameter                        |                 | VEE (V) | VCC (V) | Test Conditions |                 | MIN | NOM | MAX | UNIT |
|----------------------------------|-----------------|---------|---------|-----------------|-----------------|-----|-----|-----|------|
| Input (Control) Capacitance      | C <sub>I</sub>  | -       | -       | -               | 25°C            |     |     | 10  | pF   |
| Input (Control) Capacitance      |                 | -       | -       |                 | -40°C to +85°C  |     |     | 10  |      |
| Input (Control) Capacitance      |                 | -       | -       |                 | -55°C to +125°C |     |     | 10  |      |
| Power dissipation capacitance(1) | C <sub>PD</sub> | -       | 5       |                 | 25°C            |     | 42  |     |      |

## 10 Switching Characteristics HCT

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

| over operating free air temperature range (unless otherwise noted) |                                     |         |         |                 |                 |     |     |     |      |  |
|--|-------------------------------------|---------|---------|-----------------|-----------------|-----|-----|-----|------|--|
| Parameter  |                                     | VEE (V) | VCC (V) | Test Conditions |                 | MIN | NOM | MAX | UNIT |  |
| Propaga<br>tion<br>Delay,<br>Switch<br>In to Out                   | t <sub>PLH</sub> , t <sub>PHL</sub> | 0       | 4.5     | 50pF            | 25°C            |     |     | 12  | ns   |  |
|  |                                     |         |         |                 | –40°C to +85°C  |     |     | 15  |      |  |
|  |                                     |         |         |                 | –55°C to +125°C |     |     | 18  |      |  |
|  |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 8   |      |  |
|  |                                     |         |         |                 | –40°C to +85°C  |     |     | 10  |      |  |
|  |                                     |         |         |                 | –55°C to +125°C |     |     | 12  |      |  |
| Turn<br>"ON"<br>Time !E<br>to Out                                  | t <sub>PZH</sub> , t <sub>PZL</sub> | 0       | 4.5     | 50pF            | 25°C            |     |     | 44  | ns   |  |
|  |                                     |         |         |                 | –40°C to +85°C  |     |     | 55  |      |  |
|  |                                     |         |         |                 | –55°C to +125°C |     |     | 66  |      |  |
|  |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 42  |      |  |
|  |                                     |         |         |                 | –40°C to +85°C  |     |     | 53  |      |  |
|  |                                     |         |         |                 | –55°C to +125°C |     |     | 63  |      |  |
|  |                                     | -       | 5       | 15pF            | 25°C            |     |     | 18  |      |  |
|  |                                     | 0       | 4.5     | 50pF            | 25°C            |     |     | 56  |      |  |
|  |                                     |         |         |                 | –40°C to +85°C  |     |     | 70  |      |  |
|  |                                     |         |         |                 | –55°C to +125°C |     |     | 85  |      |  |
|  |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 42  |      |  |
|  |                                     |         |         |                 | –40°C to +85°C  |     |     | 53  |      |  |
|  |                                     |         |         |                 | –55°C to +125°C |     |     | 63  |      |  |
|  |                                     | -       | 5       | 15pF            | 25°C            |     |     | 24  |      |  |

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

| Parameter                 |                                     | VEE (V) | VCC (V) | Test Conditions |                 | MIN | NOM | MAX | UNIT |  |
|---------------------------|-------------------------------------|---------|---------|-----------------|-----------------|-----|-----|-----|------|--|
| Turn "ON" Time nS to Out  | t <sub>PZH</sub> , t <sub>PZL</sub> | 0       | 4.5     | 50pF            | 25°C            |     |     | 40  | ns   |  |
|                           |                                     |         |         |                 | –40°C to +85°C  |     |     | 53  |      |  |
|                           |                                     |         |         |                 | –55°C to +125°C |     |     | 60  |      |  |
|                           |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 34  |      |  |
|                           |                                     |         |         |                 | –40°C to +85°C  |     |     | 43  |      |  |
|                           |                                     |         |         |                 | –55°C to +125°C |     |     | 51  |      |  |
|                           |                                     | 0       | 5       | 15pF            | 25°C            |     | 17  |     |      |  |
|                           |                                     | 0       | 4.5     | 50pF            | 25°C            |     |     | 50  |      |  |
|                           |                                     |         |         |                 | –40°C to +85°C  |     |     | 63  |      |  |
|                           |                                     |         |         |                 | –55°C to +125°C |     |     | 75  |      |  |
|                           |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 34  |      |  |
|                           |                                     |         |         |                 | –40°C to +85°C  |     |     | 43  |      |  |
|                           |                                     |         |         |                 | –55°C to +125°C |     |     | 51  |      |  |
| -                         | 5                                   | 15pF    | 25°C    |                 | 18              |     |     |     |      |  |
| Turn "OFF" Time !E to Out | t <sub>PLZ</sub> , t <sub>PHZ</sub> | 0       | 4.5     | 50pF            | 25°C            |     |     | 50  | ns   |  |
|                           |                                     |         |         |                 | –40°C to +85°C  |     |     | 63  |      |  |
|                           |                                     |         |         |                 | –55°C to +125°C |     |     | 75  |      |  |
|                           |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 46  |      |  |
|                           |                                     |         |         |                 | –40°C to +85°C  |     |     | 58  |      |  |
|                           |                                     |         |         |                 | –55°C to +125°C |     |     | 69  |      |  |
|                           |                                     | -       | 5       | 15pF            | 25°C            |     | 21  |     |      |  |
| Turn "OFF" Time nS to Out | t <sub>PLZ</sub> , t <sub>PHZ</sub> | 0       | 4.5     | 50pF            | 25°C            |     |     | 44  | ns   |  |
|                           |                                     |         |         |                 | –40°C to +85°C  |     |     | 55  |      |  |
|                           |                                     |         |         |                 | –55°C to +125°C |     |     | 66  |      |  |
|                           |                                     | –4.5    | 4.5     |                 | 25°C            |     |     | 40  |      |  |
|                           |                                     |         |         |                 | –40°C to +85°C  |     |     | 50  |      |  |
|                           |                                     |         |         |                 | –55°C to +125°C |     |     | 60  |      |  |
|                           |                                     | -       | 5       | 15pF            | 25°C            |     | 18  |     |      |  |

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

| Parameter                                    |  | VEE (V) | VCC (V) | Test Conditions |                 | MIN | NOM | MAX | UNIT |
|--|--|---------|---------|-----------------|-----------------|-----|-----|-----|------|
| Input (Control) Capacitance<br>$C_i$         |  | -       | -       | -               | 25°C            |     |     | 10  | pF   |
|  |  | -       | -       | -               | -40°C to +85°C  |     |     | 10  |      |
|  |  | -       | -       | -               | -55°C to +125°C |     |     | 10  |      |
| Power dissipation capacitance(1)<br>$C_{PD}$ |  | -       | 5       | -               | 25°C            |     | 47  |     |      |

## 11 Analog Channel Specifications

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

| Parameter   | Test Conditions           |  | HC, HCT TYPES | V <sub>CC</sub> (V) | MIN | NOM   | MAX | UNIT |
|---|---------------------------|--|---------------|---------------------|-----|-------|-----|------|
| $f_{MAX}$<br>Minimum switch frequency response at -3 dB |                           |  | HC            | 4.5                 |     | 200   |     | MHz  |
|   |                           |  | HCT           | 4.5                 |     | 200   |     |      |
| THD<br>Sine-wave distortion                             | 1kHz, $V_{IS} = 4V_{P-P}$ |  | HC            | 4.5                 |     | 0.078 |     | %    |
|   | 1kHz, $V_{IS} = 8V_{P-P}$ |  |               | 9                   |     | 0.018 |     |      |
|   | 1kHz, $V_{IS} = 4V_{P-P}$ |  | HCT           | 4.5                 |     | 0.078 |     |      |
|   | 1kHz, $V_{IS} = 8V_{P-P}$ |  |               | 9                   |     | 0.018 |     |      |
| Switch "OFF" Signal Feedthrough                         |                           |  | HC            | 4.5                 |     | -62   |     | dB   |
|   |                           |  | HCT           | 4.5                 |     | -62   |     |      |
| Switch Input Capacitance, $C_S$                         |                           |  | HC            | -                   |     | 5     |     | pF   |
|   |                           |  | HCT           | -                   |     | 5     |     |      |

## 12 HCT Input Loading Table

| INPUT | UNIT LOADS <sup>(1)</sup> |
|-------|---------------------------|
| All   | 0.5                       |

(1) Unit Load is  $\Delta I_{CC}$  limit specified in DC Electrical Table, e.g., 360 $\mu$ A max at 25°C

## 13 Recommended Operating Area as a Function of Supply Voltage

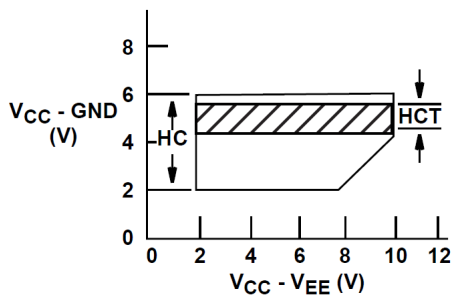


Figure 13-1.

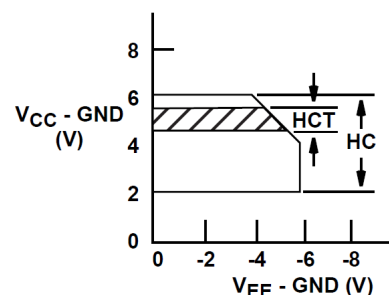


Figure 13-2.

## 14 Typical Performance Curves

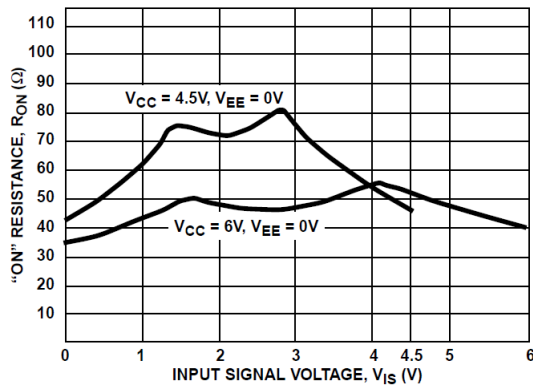


Figure 14-1. Typical On Resistance vs Input Signal Voltage

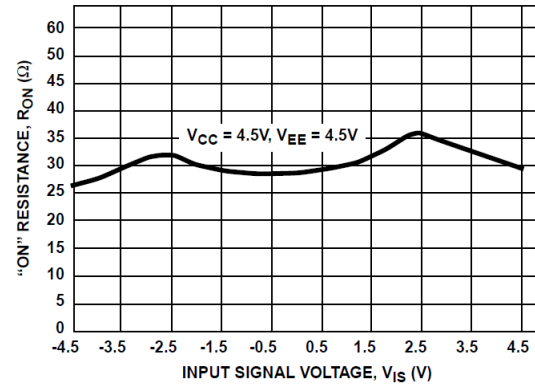


Figure 14-2. Typical On Resistance vs Input Signal Voltage

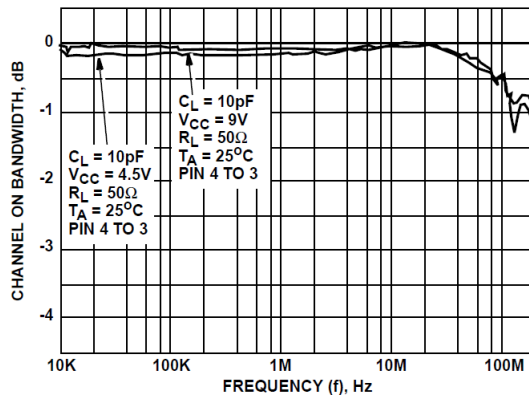


Figure 14-3. Switch Frequency Response

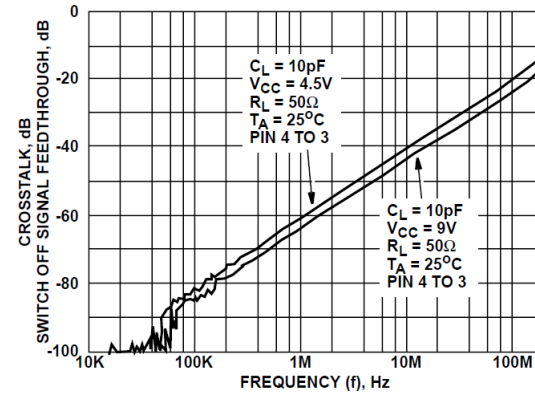


Figure 14-4. Switch-Off Signal Feedthrough and Crosstalk vs Frequency



## 15 Parameter Measurement Information

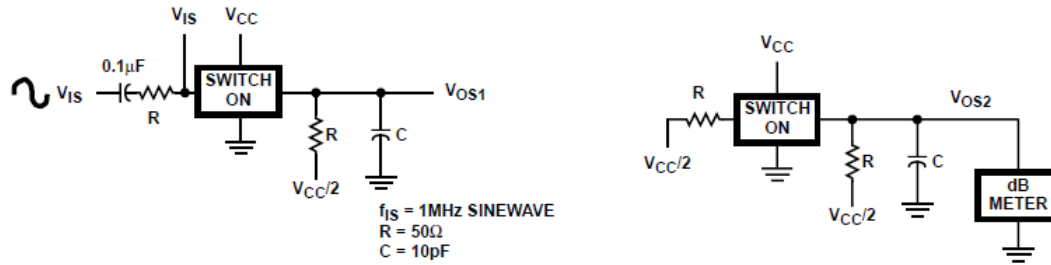


Figure 15-1. Crosstalk Between Two Switches Test Circuit

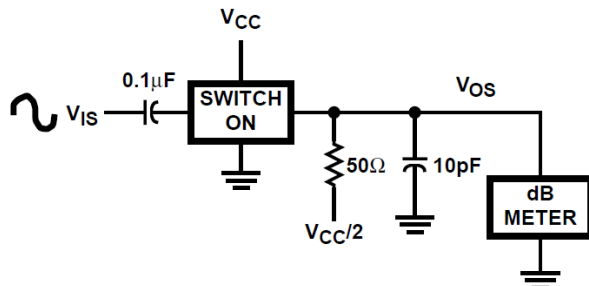


Figure 15-2. Frequency Response Test Circuit

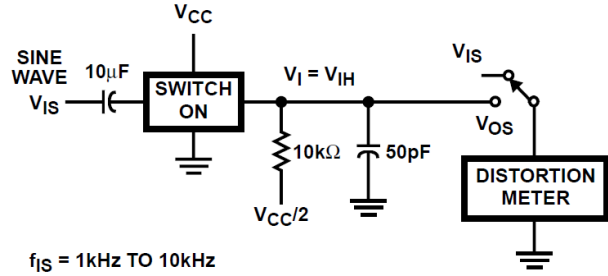


Figure 15-3. Total Harmonic Distortion Test Circuit

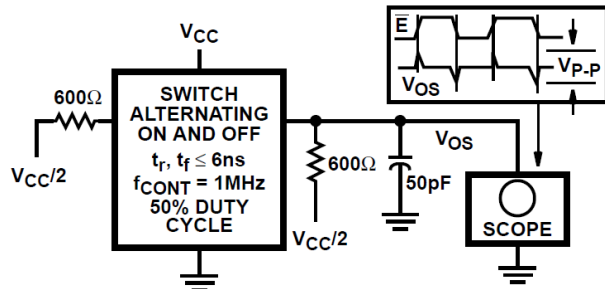


Figure 15-4. Control-To-Switch Feedthrough Noise Test Circuit

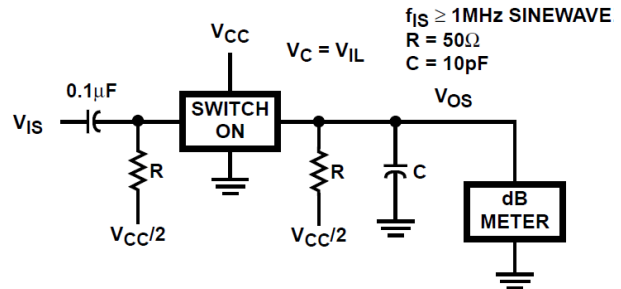


Figure 15-5. Switch Off Signal Feedthrough

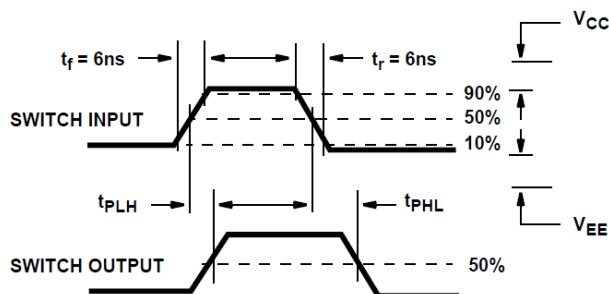


Figure 15-6. Switch Propagation Delay Times

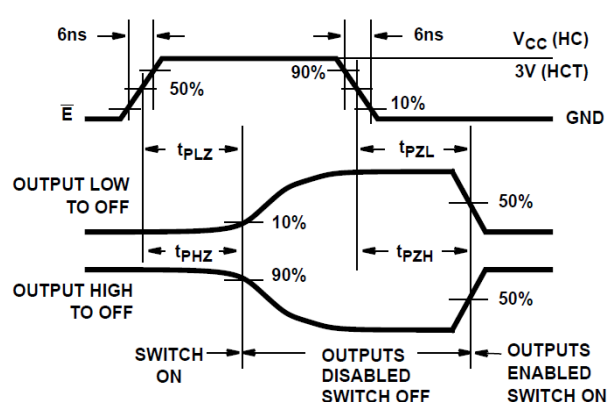
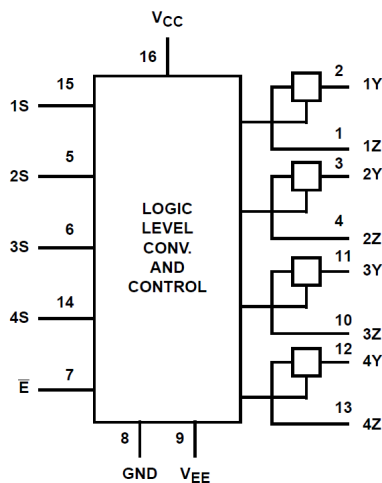


Figure 15-7. Switch Turn-On and Turn-Off Propagation Delay Times Waveforms

## 16 Detailed Description

### 16.1 Functional Block Diagram



### 16.2 Device Functional Modes

Table 16-1. Truth Table<sup>(1)</sup>

| INPUTS |   | SWITCH |
|--------|---|--------|
| E      | S |        |
| L      | L | OFF    |
| L      | H | ON     |
| H      | X | OFF    |

(1) H = High Level Voltage, L = Low Level Voltage, X = Do not Care

## 17 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

### 17.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Notifications* 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.

### 17.2 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is 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](#).

### 17.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 17.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 17.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 18 Revision History

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

| Changes from Revision D (October 2003) to Revision E (July 2024)                                      | Page |
|---|------|
| • Updated the numbering format for tables, figures, and cross-references throughout the document..... | 1    |
| • Updated thermal information.....  | 5    |
| • Updated electrical specifications.....  | 6    |
| • Updated switching specifications.....   | 10   |
| • Updated analog channel specifications.....  | 15   |
| • Updated orderable information.....  | 19   |

## 19 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 part number          | Status<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|--------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">CD54HC4316F3A</a>  | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | CD54HC4316F3A       |
| CD54HC4316F3A.A                | Active        | Production           | CDIP (J)   16   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | CD54HC4316F3A       |
| <a href="#">CD74HC4316E</a>    | NRND          | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -55 to 125   | CD74HC4316E         |
| CD74HC4316E.A                  | NRND          | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -55 to 125   | CD74HC4316E         |
| <a href="#">CD74HC4316M</a>    | Obsolete      | Production           | SOIC (D)   16   | -                     | -           | Call TI                              | Call TI                           | -55 to 125   | HC4316M             |
| <a href="#">CD74HC4316M96</a>  | Active        | Production           | SOIC (D)   16   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HC4316M             |
| CD74HC4316M96.A                | Active        | Production           | SOIC (D)   16   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HC4316M             |
| <a href="#">CD74HC4316NSR</a>  | NRND          | Production           | SOP (NS)   16   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HC4316M             |
| CD74HC4316NSR.A                | NRND          | Production           | SOP (NS)   16   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HC4316M             |
| <a href="#">CD74HC4316PW</a>   | Obsolete      | Production           | TSSOP (PW)   16 | -                     | -           | Call TI                              | Call TI                           | -55 to 125   | HJ4316              |
| <a href="#">CD74HC4316PWR</a>  | Active        | Production           | TSSOP (PW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HJ4316              |
| CD74HC4316PWR.A                | Active        | Production           | TSSOP (PW)   16 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HJ4316              |
| <a href="#">CD74HCT4316E</a>   | NRND          | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -55 to 125   | CD74HCT4316E        |
| CD74HCT4316E.A                 | NRND          | Production           | PDIP (N)   16   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -55 to 125   | CD74HCT4316E        |
| <a href="#">CD74HCT4316M</a>   | NRND          | Production           | SOIC (D)   16   | 40   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HCT4316M            |
| CD74HCT4316M.A                 | NRND          | Production           | SOIC (D)   16   | 40   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HCT4316M            |
| <a href="#">CD74HCT4316M96</a> | NRND          | Production           | SOIC (D)   16   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HCT4316M            |
| CD74HCT4316M96.A               | NRND          | Production           | SOIC (D)   16   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 125   | HCT4316M            |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

**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.

**OTHER QUALIFIED VERSIONS OF CD54HC4316, CD74HC4316 :**

- Catalog : [CD74HC4316](#)
- Military : [CD54HC4316](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

## 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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD74HC4316M96  | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD74HC4316NSR  | SOP          | NS              | 16   | 2000 | 330.0              | 16.4               | 8.1     | 10.4    | 2.5     | 12.0    | 16.0   | Q1            |
| CD74HC4316PWR  | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| CD74HCT4316M96 | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD74HC4316M96  | SOIC         | D               | 16   | 2500 | 353.0       | 353.0      | 32.0        |
| CD74HC4316NSR  | SOP          | NS              | 16   | 2000 | 353.0       | 353.0      | 32.0        |
| CD74HC4316PWR  | TSSOP        | PW              | 16   | 2000 | 353.0       | 353.0      | 32.0        |
| CD74HCT4316M96 | SOIC         | D               | 16   | 2500 | 340.5       | 336.1      | 32.0        |

## TUBE



\*All dimensions are nominal

| Device         | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CD74HC4316E    | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC4316E    | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC4316E.A  | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HC4316E.A  | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT4316E   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT4316E   | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT4316E.A | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT4316E.A | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD74HCT4316M   | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| CD74HCT4316M.A | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |



J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



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



4220204/B 12/2023

## NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220204/B 12/2023

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220204/B 12/2023

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **<br>DIM      | 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.



# PACKAGE OUTLINE

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

## NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.



# EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

4220735/A 12/2021

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.



D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



## NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- $\triangle C$  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.
- $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AC.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

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

Copyright © 2025, Texas Instruments Incorporated