



# THE DATASHEET OF MAX4592ESE





# High-Speed, Single-Supply, Quad, SPST Analog Switches

MAX4591/MAX4592/MAX4593

## General Description

The MAX4591/MAX4592/MAX4593 are high-speed, precision, quad, single-pole/single-throw (SPST) analog switches designed to operate at +12V or +15V. The MAX4591 has four normally closed (NC) switches, and the MAX4592 has four normally open (NO) switches. The MAX4593 has two NO and two NC switches. All three devices offer low leakage (100pA max) and fast switching speeds ( $t_{ON} \leq 80ns$ ,  $t_{OFF} \leq 45ns$ ).

With a +12V supply, the MAX4591/MAX4592/MAX4593 offer guaranteed  $1\Omega$  max channel-to-channel matching,  $20\Omega$  max on-resistance ( $R_{ON}$ ), and  $1.75\Omega$  max  $R_{ON}$  flatness over the specified range.

These switches are also fully specified for single +15V operation, with  $16\Omega$  max  $R_{ON}$ ,  $1.5\Omega$  max  $R_{ON}$  match, and  $1.5\Omega$  max flatness. For low-voltage or dual-supply operation, refer to the MAX391 data sheet.

These low-voltage switches also offer 5pC max charge injection, and electrostatic discharge (ESD) protection is greater than 2000V, per Method 3015.7.

## Applications

|                   |                              |
|-------------------|------------------------------|
| Test Equipment    | Sample-and-Hold Circuits     |
| Disk Drives       | Guidance and Control Systems |
| Tape Drives       | Military Radios              |
| Audio and Video   | Communications Systems       |
| Switching         | PBX, PABX                    |
| Heads-Up Displays |                              |

## Features

- ◆ Low  $16\Omega$  On-Resistance
- ◆ Fast Switching Times:  $t_{ON} = 50ns$ ,  $t_{OFF} = 30ns$
- ◆ Guaranteed  $1\Omega$  max On-Resistance Match Between Channels
- ◆ Guaranteed  $1.75\Omega$  max On-Resistance Flatness over Signal Range
- ◆ Guaranteed 5pC max Charge Injection
- ◆ Improved Leakage over Temperature: 5nA max at +85°C
- ◆ ESD >2000V per Method 3015.7
- ◆ +12V or +15V Single-Supply Operation
- ◆ Pin Compatible with DG611/DG612/DG613, DG211/DG212/DG213

## Ordering Information

| PART       | TEMP. RANGE    | PIN-PACKAGE    |
|------------|----------------|----------------|
| MAX4591CUE | 0°C to +70°C   | 16 TSSOP       |
| MAX4591CSE | 0°C to +70°C   | 16 Narrow SO   |
| MAX4591CPE | 0°C to +70°C   | 16 Plastic DIP |
| MAX4591EUE | -40°C to +85°C | 16 TSSOP       |
| MAX4591ESE | -40°C to +85°C | 16 Narrow SO   |
| MAX4591EPE | -40°C to +85°C | 16 Plastic DIP |

Ordering Information continued at end of data sheet.

## Pin Configurations/Functional Diagrams/Truth Tables

TOP VIEW

**TSSOP/SO/DIP**

| MAX4591 |        |
|---------|--------|
| LOGIC   | SWITCH |
| 0       | ON     |
| 1       | OFF    |

N.C. = NO CONNECTION

**TSSOP/SO/DIP**

| MAX4592 |        |
|---------|--------|
| LOGIC   | SWITCH |
| 0       | OFF    |
| 1       | ON     |

SWITCHES SHOWN FOR LOGIC "0" INPUT

**TSSOP/SO/DIP**

| MAX4593 |               |               |
|---------|---------------|---------------|
| LOGIC   | SWITCHES 1, 4 | SWITCHES 2, 3 |
| 0       | OFF           | ON            |
| 1       | ON            | OFF           |



# High-Speed, Single-Supply, Quad, SPST Analog Switches

## ABSOLUTE MAXIMUM RATINGS

|  |               |
|--|---------------|
| V+ to GND .....  | -0.3V to +17V |
| VIN_, VCOM_, VNC_, VNO_ (Note 1) .....   | V- to V+      |
| Current (any terminal) .....   | 30mA          |
| Peak Current, COM_, NO_, NC_ (pulsed at 1ms, 10% duty cycle max) .....                         | 100mA         |
| ESD per Method 3015.7 .....  | >2000V        |
| Continuous Power Dissipation (TA = +70°C)<br>16-Pin TSSOP (derate 5.70mW/°C above +70°C) ..... | 457mW         |

|  |                 |
|--|-----------------|
| 16-Pin Narrow SO (derate 8.70mW/°C above +70°C) .....    | 696mW           |
| 16-Pin Plastic DIP (derate 10.53mW/°C above +70°C) ..... | 842mW           |
| Operating Temperature Ranges                             |                 |
| MAX459_C_E .....   | 0°C to +70°C    |
| MAX459_E_E .....   | -40°C to +85°C  |
| Storage Temperature Range .....                          | -65°C to +150°C |
| Lead Temperature (soldering, 10s) .....                  | +300°C          |

**Note 1:** Signals on NC\_, NO\_, COM\_, or IN\_ exceeding V+ or V- are clamped by internal diodes. Limit forward diode current to maximum current rating.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS—Single +12V Supply

(V+ = +12V, V- = GND = 0, VINH = 5V, VINL = 0.8V, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.) (Note 2)

| PARAMETER                                     | SYMBOL                 | CONDITIONS   | MIN                | TYP         | MAX        | UNITS     |
|---|------------------------|--|--------------------|-------------|------------|-----------|
| <b>ANALOG SWITCH</b>                          |                        |  |                    |             |            |           |
| Analog Signal Range                           | VCOM_, VNO_, VNC_      | (Note 3)   | C, E               | V-          | V+         | V         |
| On-Resistance                                 | RON                    | ICOM_ = -10mA, VNO_ or VNC_ = 10V                                | TA = +25°C<br>C, E | 16<br>20    | 24         | Ω         |
| On-Resistance Match Between Channels (Note 4) | ΔRON                   | ICOM_ = -10mA, VNO_ or VNC_ = 10V                                | TA = +25°C<br>C, E | 0.5         | 1<br>1.5   | Ω         |
| On-Resistance Flatness (Note 5)               | RFLAT(ON)              | ICOM_ = -10mA; VNO_ or VNC_ = 3V, 6V, 9V                         | TA = +25°C<br>C, E | 1           | 1.75<br>2  | Ω         |
| NO or NC Off-Leakage Current (Note 6)         | INO_(OFF) or INC_(OFF) | V+ = 15.5V; VCOM_ = 14V, 1V; VNO_ or VNC_ = 1V, 14V              | TA = +25°C<br>C, E | -0.1<br>-5  | 0.01<br>5  | 0.1<br>nA |
| COM Off-Leakage Current (Note 6)              | ICOM_(OFF)             | V+ = 15.5V; VCOM_ = 14V, 1V; VNO_ or VNC_ = 1V, 14V              | TA = +25°C<br>C, E | -0.1<br>-5  | 0.01<br>5  | 0.1<br>nA |
| COM On-Leakage Current (Note 6)               | ICOM_(ON)              | V+ = 15.5V; VCOM_ = 14V, 1V; VNO_ or VNC_ = 14V, 1V, or floating | TA = +25°C<br>C, E | -0.2<br>-10 | 0.01<br>10 | 0.2<br>nA |

# High-Speed, Single-Supply, Quad, SPST Analog Switches

MAX4591/MAX4592/MAX4593

## ELECTRICAL CHARACTERISTICS—Single +12V Supply (continued)

(V+ = +12V, V- = GND = 0, VINH = 5V, VINL = 0.8V, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.) (Note 2)

| PARAMETER                             | SYMBOL     | CONDITIONS                                       |            | MIN  | TYP   | MAX | UNITS |
|---------------------------------------|------------|--|------------|------|-------|-----|-------|
| <b>LOGIC INPUT</b>                    |            |  |            |      |       |     |       |
| Input Current with Input Voltage High | IINH       | IN_ = V+, all others = 0.8V                      |            | -0.5 | 0.005 | 0.5 | μA    |
| Input Current with Input Voltage Low  | IINL       | IN_ = 0.8V, all others = V+                      |            | -0.5 | 0.005 | 0.5 | μA    |
| <b>DYNAMIC</b>                        |            |  |            |      |       |     |       |
| Turn-On Time                          | tON        | VCOM_ = 10V, Figure 2                            | TA = +25°C | 50   | 80    |     | ns    |
|                                       |            |  | C, E       |      | 90    |     |       |
| Turn-Off Time                         | tOFF       | VCOM_ = 10V, Figure 2                            | TA = +25°C | 30   | 45    |     | ns    |
|                                       |            |  | C, E       |      | 50    |     |       |
| Break-Before-Make Time Delay (Note 3) | tD         | MAX4593 only, RL = 300Ω, CL = 35pF, Figure 3     |            | 5    | 20    |     | ns    |
| Charge Injection (Note 3)             | Q          | CL = 1nF, VGEN = 0, RGEN = 0Ω, Figure 4          | TA = +25°C |      | 2     | 5   | pC    |
| Off-Isolation (Note 7)                | OIRR       | RL = 50Ω, CL = 5pF, f = 10MHz, Figure 5          | TA = +25°C |      | 72    |     | dB    |
| Crosstalk (Note 8)                    |            | RL = 50Ω, CL = 5pF, f = 10MHz, Figure 6          | TA = +25°C |      | 85    |     | dB    |
| NC_ or NO_ Capacitance                | C(OFF)     | f = 1MHz, Figure 7                               | TA = +25°C |      | 9     |     | pF    |
| COM_ Off-Capacitance                  | CCOM_(OFF) | f = 1MHz, Figure 7                               | TA = +25°C |      | 9     |     | pF    |
| COM_ On-Capacitance                   | CCOM_(ON)  | f = 1MHz, Figure 8                               | TA = +25°C |      | 22    |     | pF    |
| <b>SUPPLY</b>                         |            |  |            |      |       |     |       |
| Power-Supply Range                    |            |  |            | 3    |       | 16  | V     |
| Positive Supply Current               | I+         | V+ = 15V, VINL = 0 or V+, all channels on or off | C, E       | -1   | 0.001 | 1   | μA    |

# High-Speed, Single-Supply, Quad, SPST Analog Switches

## ELECTRICAL CHARACTERISTICS—Single +15V Supply

(V+ = +15V, V- = GND = 0, VINH = 5V, VINL = 0.8V, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.) (Note 2)

| PARAMETER   | SYMBOL   | CONDITIONS   |                    | MIN  | TYP   | MAX | UNITS |
|---|--|--|--------------------|------|-------|-----|-------|
| <b>ANALOG SWITCH</b>                              |  |  |                    |      |       |     |       |
| Analog Signal Range                               | VCOM-, VNO-, VNC-                              | (Note 3)   |                    | 0    |       | V+  | V     |
| On-Resistance                                     | RON  | I <sub>COM-</sub> = -10mA, V <sub>NO-</sub> or V <sub>NC-</sub> = 10V                                | TA = +25°C<br>C, E |      | 12    | 16  | Ω     |
|   |  |  |                    |      |       | 2.0 |       |
| On-Resistance Match Between Channels (Notes 3, 4) | ΔRON   | I <sub>COM-</sub> = -10mA, V <sub>NO-</sub> or V <sub>NC-</sub> = 10V                                | TA = +25°C<br>C, E |      | 0.5   | 1.5 | Ω     |
|   |  |  |                    |      |       | 2.0 |       |
| On-Resistance Flatness (Notes 3, 5)               | R <sub>FLAT(ON)</sub>                          | I <sub>COM-</sub> = -10mA; V <sub>NO-</sub> or V <sub>NC-</sub> = 3V, 6V, 9V                         | TA = +25°C<br>C, E |      | 0.7   | 1.5 | Ω     |
|   |  |  |                    |      |       | 2.0 |       |
| NO- or NC- Off-Leakage Current (Note 6)           | I <sub>NO-(OFF)</sub> or I <sub>NC-(OFF)</sub> | V+ = 15.5V; V <sub>COM-</sub> = 14V, 1V; V <sub>NO-</sub> or V <sub>NC-</sub> = 1V, 14V              | TA = +25°C<br>C, E | -0.1 | 0.01  | 0.1 | nA    |
|   |  |  |                    | -5   |       | 5   |       |
| COM- Off-Leakage Current (Note 6)                 | I <sub>COM-(OFF)</sub>                         | V+ = 15.5V; V <sub>COM-</sub> = 14V, 1V; V <sub>NO-</sub> or V <sub>NC-</sub> = 1V, 14V              | TA = +25°C<br>C, E | -0.1 | 0.01  | 0.1 | nA    |
|   |  |  |                    | -5   |       | 5   |       |
| COM- On-Leakage Current (Note 6)                  | I <sub>COM-(ON)</sub>                          | V+ = 15.5V; V <sub>COM-</sub> = 14V, 1V; V <sub>NO-</sub> or V <sub>NC-</sub> = 14V, 1V, or floating | TA = +25°C<br>C, E | -0.2 | 0.02  | 0.2 | nA    |
|   |  |  |                    | -10  |       | 10  |       |
| <b>DYNAMIC</b>                                    |  |  |                    |      |       |     |       |
| Turn-On Time                                      | t <sub>ON</sub>                                | V <sub>NO-</sub> or V <sub>NC-</sub> = 10V, Figure 2   | TA = +25°C<br>C, E |      | 60    | 80  | ns    |
|   |  |  |                    |      |       | 90  |       |
| Turn-Off Time                                     | t <sub>OFF</sub>                               | V <sub>NO-</sub> or V <sub>NC-</sub> = 10V, Figure 2   | TA = +25°C<br>C, E |      | 30    | 40  | ns    |
|   |  |  |                    |      |       | 50  |       |
| Break-Before-Make Time Delay (Note 3)             | t <sub>D</sub>                                 | MAX4593 only, R <sub>L</sub> = 300Ω, C <sub>L</sub> = 35pF   |                    | 5    | 20    |     | ns    |
| Charge Injection (Note 3)                         | Q  | C <sub>L</sub> = 1nF, V <sub>GEN</sub> = 0, R <sub>GEN</sub> = 0Ω, Figure 4                          | TA = +25°C         |      | 2     | 5   | pC    |
| <b>SUPPLY</b>                                     |  |  |                    |      |       |     |       |
| Positive Supply Current                           | I+   | V+ = 15V, V <sub>INL</sub> = 0 or V+, all channels on or off   |                    | -1   | 0.001 | 1   | μA    |
| Negative Supply Current                           | I-   | V+ = 15V, V <sub>INL</sub> = 0 or V+, all channels on or off   |                    | -1   | 0.001 | 1   | μA    |

**Note 2:** The algebraic convention, where the most negative value is a minimum and the most positive value a maximum, is used in this data sheet.

**Note 3:** Guaranteed by design.

**Note 4:** ΔRON = ΔRON max - ΔRON min.

**Note 5:** Flatness is defined as the difference between the maximum and minimum value of on-resistance as measured over the specified analog signal range.

**Note 6:** Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.

**Note 7:** Off-isolation = 20log<sub>10</sub> [V<sub>COM</sub> / (V<sub>NC</sub> or V<sub>NO</sub>)], V<sub>COM</sub> = output, V<sub>NC</sub> or V<sub>NO</sub> = input to off switch.

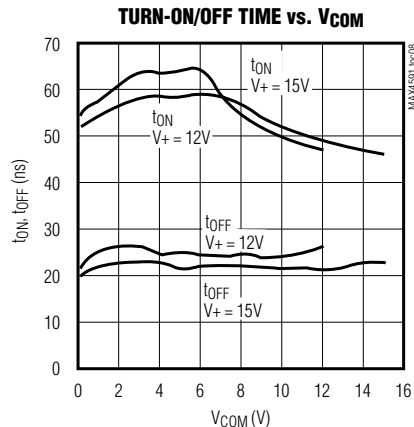
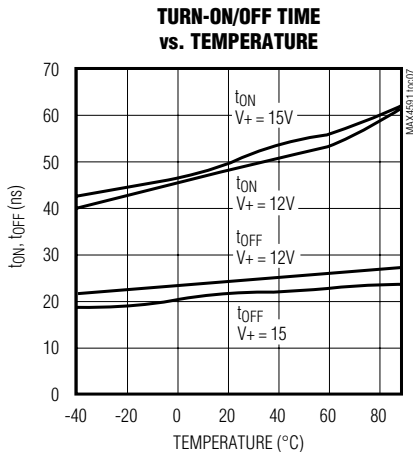
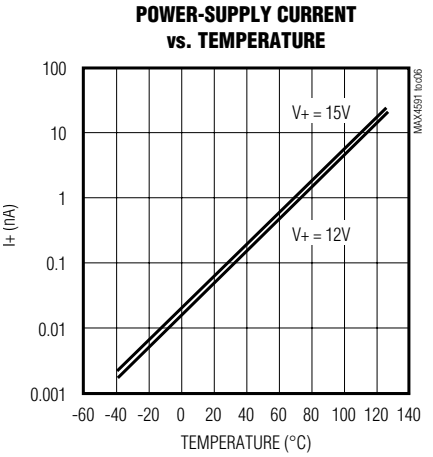
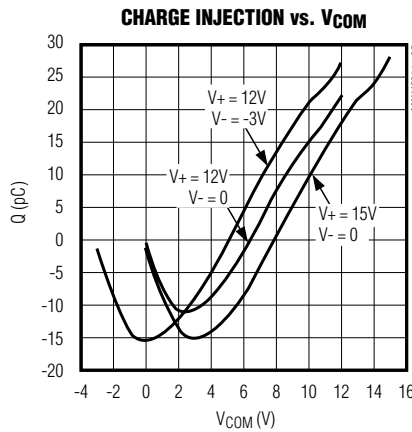
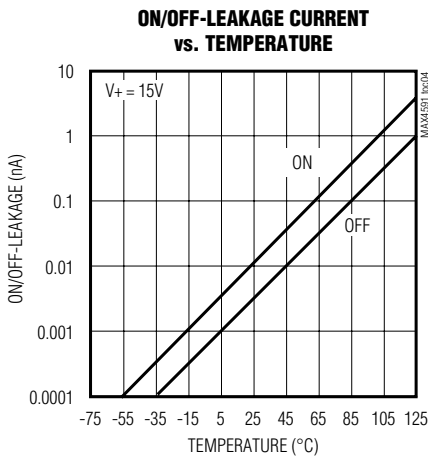
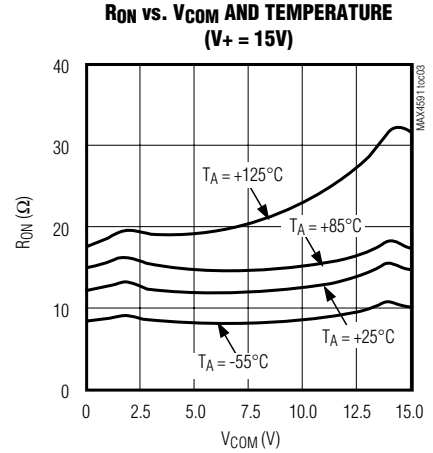
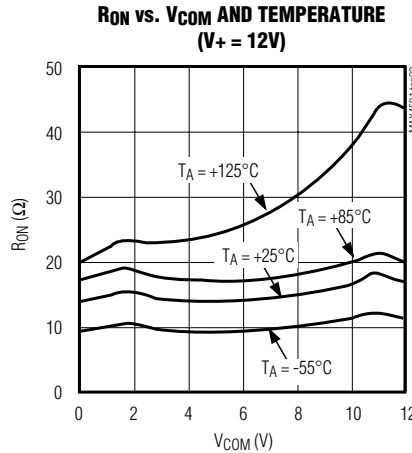
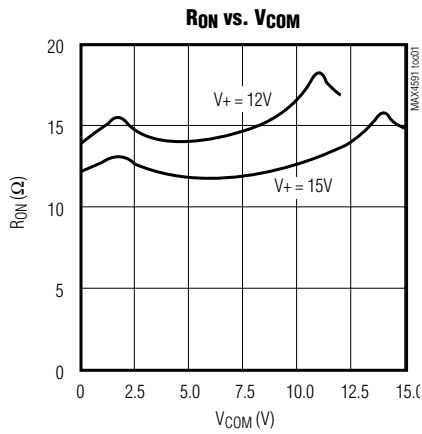
**Note 8:** Between any two switches.

# High-Speed, Single-Supply, Quad, SPST Analog Switches

## Typical Operating Characteristics

( $V_- = \text{GND} = 0$ ,  $\text{IN}_- = 0$  or  $V_+$ ,  $T_A = +25^\circ\text{C}$ , unless otherwise noted.)

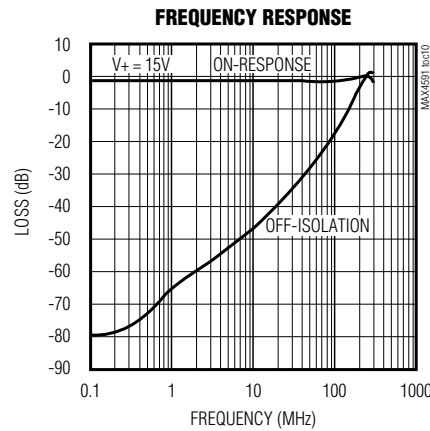
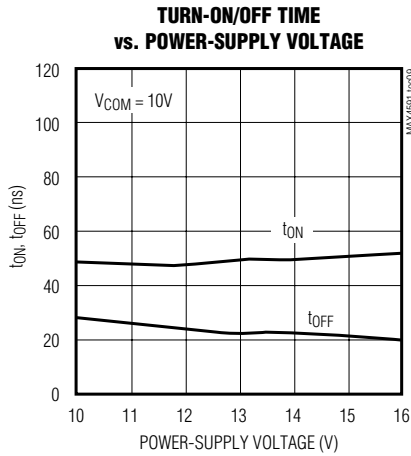
MAX4591/MAX4592/MAX4593



# High-Speed, Single-Supply, Quad, SPST Analog Switches

## Typical Operating Characteristics (continued)

(V<sub>-</sub> = GND = 0, I<sub>N</sub> = 0 or V<sub>+</sub>, T<sub>A</sub> = +25°C, unless otherwise noted.)



## Pin Description

| PIN          | NAME                     | FUNCTION  |
|--------------|--------------------------|---|
| 1, 16, 9, 8  | IN1–IN4                  | Switch Input Terminals. Drive ≤ 0.8V for logic “0”; drive ≥ 5V for logic “1”. |
| 2, 15, 10, 7 | COM1–COM4                | Analog Switch Common Terminal   |
| 3, 14, 11, 6 | NO1–NO4<br>or<br>NC1–NC4 | Switch Inputs   |
| 4            | V-                       | Negative Supply Voltage Input. Normally connected to ground.                  |
| 5            | GND                      | Ground  |
| 12           | N.C.                     | No Connection. Not internally connected.                                      |
| 13           | V+                       | Positive Supply Voltage Input. Connected to substrate.                        |

## Applications Information

### Overvoltage Protection

Proper power-supply sequencing is recommended for all CMOS devices. Do not exceed the absolute maximum ratings because stresses beyond the listed ratings may cause permanent damage to the devices. Always sequence V<sub>+</sub> on first, followed by the logic inputs. If power-supply sequencing is not possible, add a small signal diode in series with V<sub>+</sub> for overvoltage protection (Figure 1). Adding a diode reduces the analog signal range to 1V below V<sub>+</sub>, but low switch resistance and low leakage characteristics are unaffected. Device operation is unchanged, and the difference between V<sub>+</sub> and V<sub>-</sub> should not exceed 17V.

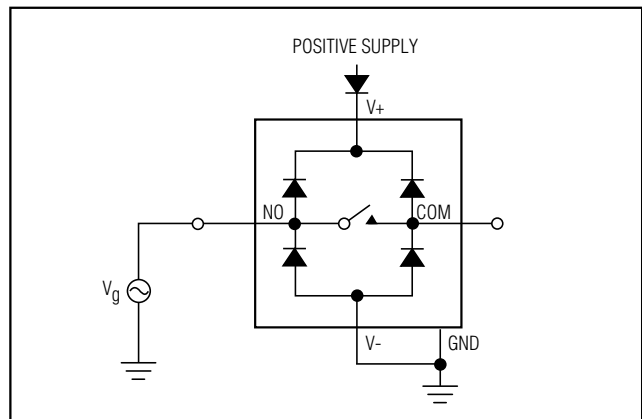


Figure 1. Overvoltage Protection Using Two External Blocking Diodes

# High-Speed, Single-Supply, Quad, SPST Analog Switches

## Test Circuits/Timing Diagrams

MAX4591/MAX4592/MAX4593

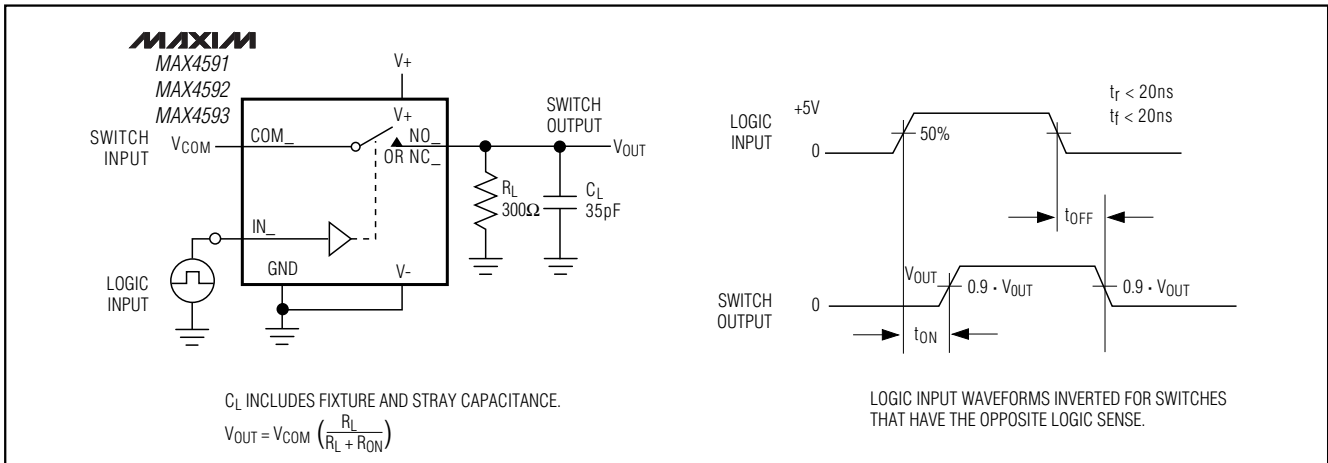


Figure 2. Switching Time

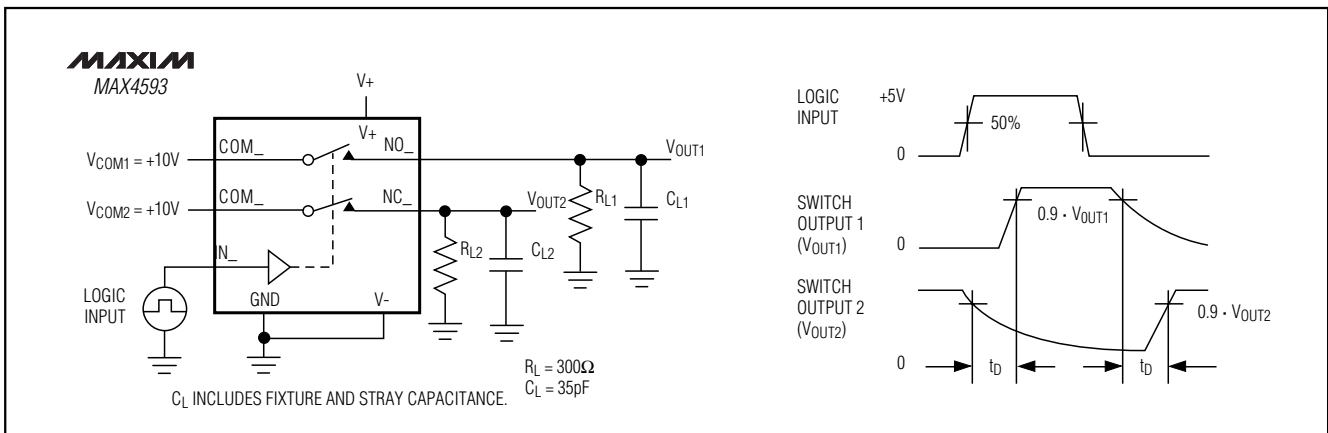


Figure 3. Break-Before-Make Interval (MAX4593 Only)

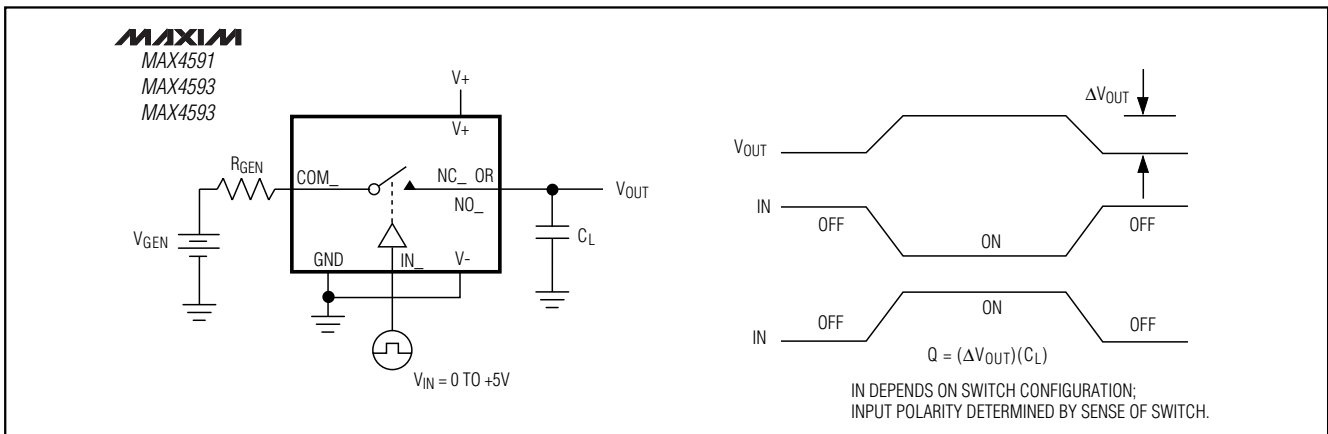


Figure 4. Charge Injection

# High-Speed, Single-Supply, Quad, SPST Analog Switches

## Test Circuits/Timing Diagrams (continued)

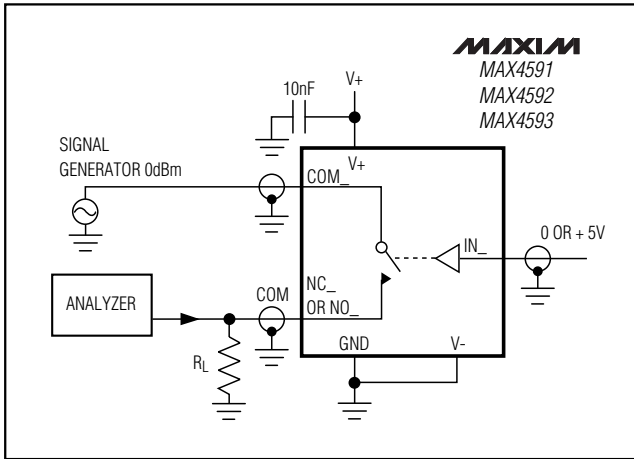


Figure 5. Off-Isolation

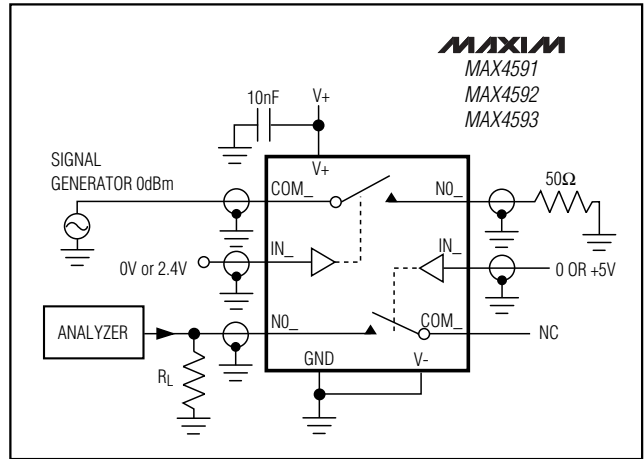


Figure 6. Crosstalk

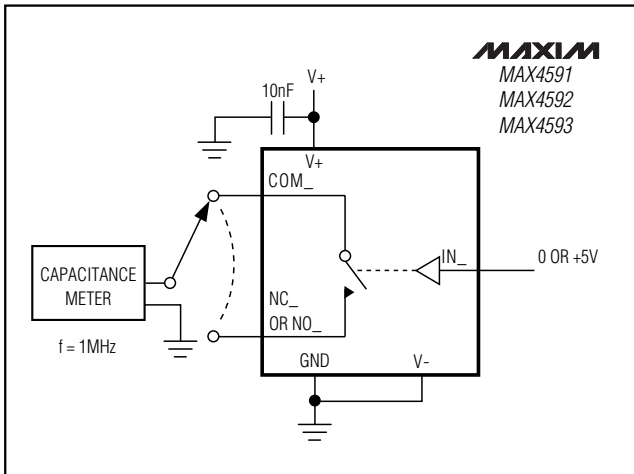


Figure 7. Channel Off-Capacitance

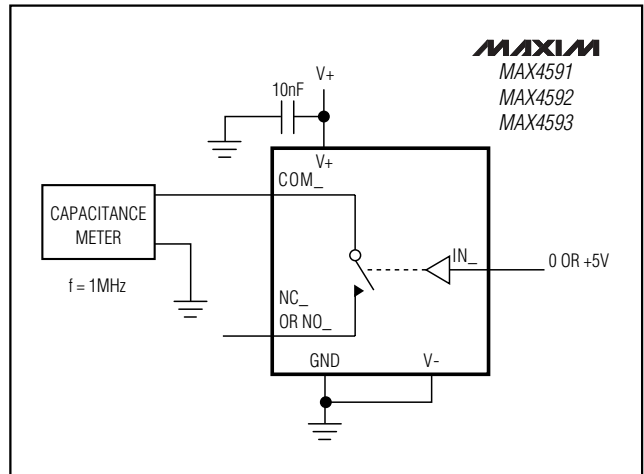


Figure 8. Channel On-Capacitance

# High-Speed, Single-Supply, Quad, SPST Analog Switches

## Ordering Information (continued)

| PART       | TEMP. RANGE    | PIN-PACKAGE    |
|------------|----------------|----------------|
| MAX4592CUE | 0°C to +70°C   | 16 TSSOP       |
| MAX4592CSE | 0°C to +70°C   | 16 Narrow SO   |
| MAX4592CPE | 0°C to +70°C   | 16 Plastic DIP |
| MAX4592EUE | -40°C to +85°C | 16 TSSOP       |
| MAX4592ESE | -40°C to +85°C | 16 Narrow SO   |
| MAX4592EPE | -40°C to +85°C | 16 Plastic DIP |
| MAX4593CUE | 0°C to +70°C   | 16 TSSOP       |
| MAX4593CSE | 0°C to +70°C   | 16 Narrow SO   |
| MAX4593CPE | 0°C to +70°C   | 16 Plastic DIP |
| MAX4593EUE | -40°C to +85°C | 16 TSSOP       |
| MAX4593ESE | -40°C to +85°C | 16 Narrow SO   |
| MAX4593EPE | -40°C to +85°C | 16 Plastic DIP |

## Chip Information

TRANSISTOR COUNT: 76

MAX4591/MAX4592/MAX4593

## Package Information

| DIMENSION |             |        |      | SYMBOL      |        |      |             |
|-----------|-------------|--------|------|-------------|--------|------|-------------|
| UNIT      | MILLIMETERS | INCHES | UNIT | MILLIMETERS | INCHES | UNIT | MILLIMETERS |
| 1         | 1.27        | 0.050  | 2    | 0.25        | 0.010  | 3    | 0.25        |
| 4         | 0.25        | 0.010  | 5    | 0.25        | 0.010  | 6    | 0.25        |
| 7         | 0.25        | 0.010  | 8    | 0.25        | 0.010  | 9    | 0.25        |
| 10        | 0.25        | 0.010  | 11   | 0.25        | 0.010  | 12   | 0.25        |
| 13        | 0.25        | 0.010  | 14   | 0.25        | 0.010  | 15   | 0.25        |
| 16        | 0.25        | 0.010  | 17   | 0.25        | 0.010  | 18   | 0.25        |
| 19        | 0.25        | 0.010  | 20   | 0.25        | 0.010  | 21   | 0.25        |
| 22        | 0.25        | 0.010  | 23   | 0.25        | 0.010  | 24   | 0.25        |
| 25        | 0.25        | 0.010  | 26   | 0.25        | 0.010  | 27   | 0.25        |
| 28        | 0.25        | 0.010  | 29   | 0.25        | 0.010  | 30   | 0.25        |
| 31        | 0.25        | 0.010  | 32   | 0.25        | 0.010  | 33   | 0.25        |
| 34        | 0.25        | 0.010  | 35   | 0.25        | 0.010  | 36   | 0.25        |
| 37        | 0.25        | 0.010  | 38   | 0.25        | 0.010  | 39   | 0.25        |
| 40        | 0.25        | 0.010  | 41   | 0.25        | 0.010  | 42   | 0.25        |
| 43        | 0.25        | 0.010  | 44   | 0.25        | 0.010  | 45   | 0.25        |
| 46        | 0.25        | 0.010  | 47   | 0.25        | 0.010  | 48   | 0.25        |
| 49        | 0.25        | 0.010  | 50   | 0.25        | 0.010  | 51   | 0.25        |
| 52        | 0.25        | 0.010  | 53   | 0.25        | 0.010  | 54   | 0.25        |
| 55        | 0.25        | 0.010  | 56   | 0.25        | 0.010  | 57   | 0.25        |
| 58        | 0.25        | 0.010  | 59   | 0.25        | 0.010  | 60   | 0.25        |
| 61        | 0.25        | 0.010  | 62   | 0.25        | 0.010  | 63   | 0.25        |
| 64        | 0.25        | 0.010  | 65   | 0.25        | 0.010  | 66   | 0.25        |
| 67        | 0.25        | 0.010  | 68   | 0.25        | 0.010  | 69   | 0.25        |
| 70        | 0.25        | 0.010  | 71   | 0.25        | 0.010  | 72   | 0.25        |
| 73        | 0.25        | 0.010  | 74   | 0.25        | 0.010  | 75   | 0.25        |
| 76        | 0.25        | 0.010  | 77   | 0.25        | 0.010  | 78   | 0.25        |
| 79        | 0.25        | 0.010  | 80   | 0.25        | 0.010  | 81   | 0.25        |
| 82        | 0.25        | 0.010  | 83   | 0.25        | 0.010  | 84   | 0.25        |
| 85        | 0.25        | 0.010  | 86   | 0.25        | 0.010  | 87   | 0.25        |
| 88        | 0.25        | 0.010  | 89   | 0.25        | 0.010  | 90   | 0.25        |
| 91        | 0.25        | 0.010  | 92   | 0.25        | 0.010  | 93   | 0.25        |
| 94        | 0.25        | 0.010  | 95   | 0.25        | 0.010  | 96   | 0.25        |
| 97        | 0.25        | 0.010  | 98   | 0.25        | 0.010  | 99   | 0.25        |
| 100       | 0.25        | 0.010  | 101  | 0.25        | 0.010  | 102  | 0.25        |
| 103       | 0.25        | 0.010  | 104  | 0.25        | 0.010  | 105  | 0.25        |
| 106       | 0.25        | 0.010  | 107  | 0.25        | 0.010  | 108  | 0.25        |
| 109       | 0.25        | 0.010  | 110  | 0.25        | 0.010  | 111  | 0.25        |
| 112       | 0.25        | 0.010  | 113  | 0.25        | 0.010  | 114  | 0.25        |
| 115       | 0.25        | 0.010  | 116  | 0.25        | 0.010  | 117  | 0.25        |
| 118       | 0.25        | 0.010  | 119  | 0.25        | 0.010  | 120  | 0.25        |
| 121       | 0.25        | 0.010  | 122  | 0.25        | 0.010  | 123  | 0.25        |
| 124       | 0.25        | 0.010  | 125  | 0.25        | 0.010  | 126  | 0.25        |
| 127       | 0.25        | 0.010  | 128  | 0.25        | 0.010  | 129  | 0.25        |
| 130       | 0.25        | 0.010  | 131  | 0.25        | 0.010  | 132  | 0.25        |
| 133       | 0.25        | 0.010  | 134  | 0.25        | 0.010  | 135  | 0.25        |
| 136       | 0.25        | 0.010  | 137  | 0.25        | 0.010  | 138  | 0.25        |
| 139       | 0.25        | 0.010  | 140  | 0.25        | 0.010  | 141  | 0.25        |
| 142       | 0.25        | 0.010  | 143  | 0.25        | 0.010  | 144  | 0.25        |
| 145       | 0.25        | 0.010  | 146  | 0.25        | 0.010  | 147  | 0.25        |
| 148       | 0.25        | 0.010  | 149  | 0.25        | 0.010  | 150  | 0.25        |
| 151       | 0.25        | 0.010  | 152  | 0.25        | 0.010  | 153  | 0.25        |
| 154       | 0.25        | 0.010  | 155  | 0.25        | 0.010  | 156  | 0.25        |
| 157       | 0.25        | 0.010  | 158  | 0.25        | 0.010  | 159  | 0.25        |
| 160       | 0.25        | 0.010  | 161  | 0.25        | 0.010  | 162  | 0.25        |
| 163       | 0.25        | 0.010  | 164  | 0.25        | 0.010  | 165  | 0.25        |
| 166       | 0.25        | 0.010  | 167  | 0.25        | 0.010  | 168  | 0.25        |
| 169       | 0.25        | 0.010  | 170  | 0.25        | 0.010  | 171  | 0.25        |
| 172       | 0.25        | 0.010  | 173  | 0.25        | 0.010  | 174  | 0.25        |
| 175       | 0.25        | 0.010  | 176  | 0.25        | 0.010  | 177  | 0.25        |
| 178       | 0.25        | 0.010  | 179  | 0.25        | 0.010  | 180  | 0.25        |
| 181       | 0.25        | 0.010  | 182  | 0.25        | 0.010  | 183  | 0.25        |
| 184       | 0.25        | 0.010  | 185  | 0.25        | 0.010  | 186  | 0.25        |
| 187       | 0.25        | 0.010  | 188  | 0.25        | 0.010  | 189  | 0.25        |
| 190       | 0.25        | 0.010  | 191  | 0.25        | 0.010  | 192  | 0.25        |
| 193       | 0.25        | 0.010  | 194  | 0.25        | 0.010  | 195  | 0.25        |
| 196       | 0.25        | 0.010  | 197  | 0.25        | 0.010  | 198  | 0.25        |
| 199       | 0.25        | 0.010  | 200  | 0.25        | 0.010  | 201  | 0.25        |
| 202       | 0.25        | 0.010  | 203  | 0.25        | 0.010  | 204  | 0.25        |
| 205       | 0.25        | 0.010  | 206  | 0.25        | 0.010  | 207  | 0.25        |
| 208       | 0.25        | 0.010  | 209  | 0.25        | 0.010  | 210  | 0.25        |
| 211       | 0.25        | 0.010  | 212  | 0.25        | 0.010  | 213  | 0.25        |
| 214       | 0.25        | 0.010  | 215  | 0.25        | 0.010  | 216  | 0.25        |
| 217       | 0.25        | 0.010  | 218  | 0.25        | 0.010  | 219  | 0.25        |
| 220       | 0.25        | 0.010  | 221  | 0.25        | 0.010  | 222  | 0.25        |
| 223       | 0.25        | 0.010  | 224  | 0.25        | 0.010  | 225  | 0.25        |
| 226       | 0.25        | 0.010  | 227  | 0.25        | 0.010  | 228  | 0.25        |
| 229       | 0.25        | 0.010  | 230  | 0.25        | 0.010  | 231  | 0.25        |
| 232       | 0.25        | 0.010  | 233  | 0.25        | 0.010  | 234  | 0.25        |
| 235       | 0.25        | 0.010  | 236  | 0.25        | 0.010  | 237  | 0.25        |
| 238       | 0.25        | 0.010  | 239  | 0.25        | 0.010  | 240  | 0.25        |
| 241       | 0.25        | 0.010  | 242  | 0.25        | 0.010  | 243  | 0.25        |
| 244       | 0.25        | 0.010  | 245  | 0.25        | 0.010  | 246  | 0.25        |
| 247       | 0.25        | 0.010  | 248  | 0.25        | 0.010  | 249  | 0.25        |
| 250       | 0.25        | 0.010  | 251  | 0.25        | 0.010  | 252  | 0.25        |
| 253       | 0.25        | 0.010  | 254  | 0.25        | 0.010  | 255  | 0.25        |
| 256       | 0.25        | 0.010  | 257  | 0.25        | 0.010  | 258  | 0.25        |
| 259       | 0.25        | 0.010  | 260  | 0.25        | 0.010  | 261  | 0.25        |
| 262       | 0.25        | 0.010  | 263  | 0.25        | 0.010  | 264  | 0.25        |
| 265       | 0.25        | 0.010  | 266  | 0.25        | 0.010  | 267  | 0.25        |
| 268       | 0.25        | 0.010  | 269  | 0.25        | 0.010  | 270  | 0.25        |
| 271       | 0.25        | 0.010  | 272  | 0.25        | 0.010  | 273  | 0.25        |
| 274       | 0.25        | 0.010  | 275  | 0.25        | 0.010  | 276  | 0.25        |
| 277       | 0.25        | 0.010  | 278  | 0.25        | 0.010  | 279  | 0.25        |
| 280       | 0.25        | 0.010  | 281  | 0.25        | 0.010  | 282  | 0.25        |
| 283       | 0.25        | 0.010  | 284  | 0.25        | 0.010  | 285  | 0.25        |
| 286       | 0.25        | 0.010  | 287  | 0.25        | 0.010  | 288  | 0.25        |
| 289       | 0.25        | 0.010  | 290  | 0.25        | 0.010  | 291  | 0.25        |
| 292       | 0.25        | 0.010  | 293  | 0.25        | 0.010  | 294  | 0.25        |
| 295       | 0.25        | 0.010  | 296  | 0.25        | 0.010  | 297  | 0.25        |
| 298       | 0.25        | 0.010  | 299  | 0.25        | 0.010  | 300  | 0.25        |
| 301       | 0.25        | 0.010  | 302  | 0.25        | 0.010  | 303  | 0.25        |
| 304       | 0.25        | 0.010  | 305  | 0.25        | 0.010  | 306  | 0.25        |
| 307       | 0.25        | 0.010  | 308  | 0.25        | 0.010  | 309  | 0.25        |
| 310       | 0.25        | 0.010  | 311  | 0.25        | 0.010  | 312  | 0.25        |
| 313       | 0.25        | 0.010  | 314  | 0.25        | 0.010  | 315  | 0.25        |
| 316       | 0.25        | 0.010  | 317  | 0.25        | 0.010  | 318  | 0.25        |
| 319       | 0.25        | 0.010  | 320  | 0.25        | 0.010  | 321  | 0.25        |
| 322       | 0.25        | 0.010  | 323  | 0.25        | 0.010  | 324  | 0.25        |
| 325       | 0.25        | 0.010  | 326  | 0.25        | 0.010  | 327  | 0.25        |
| 328       | 0.25        | 0.010  | 329  | 0.25        | 0.010  | 330  | 0.25        |
| 331       | 0.25        | 0.010  | 332  | 0.25        | 0.010  | 333  | 0.25        |
| 334       | 0.25        | 0.010  | 335  | 0.25        | 0.010  | 336  | 0.25        |
| 337       | 0.25        | 0.010  | 338  | 0.25        | 0.010  | 339  | 0.25        |
| 340       | 0.25        | 0.010  | 341  | 0.25        | 0.010  | 342  | 0.25        |
| 343       | 0.25        | 0.010  | 344  | 0.25        | 0.010  | 345  | 0.25        |
| 346       | 0.25        | 0.010  | 347  | 0.25        | 0.010  | 348  | 0.25        |
| 349       | 0.25        | 0.010  | 350  | 0.25        | 0.010  | 351  | 0.25        |
| 352       | 0.25        | 0.010  | 353  | 0.25        | 0.010  | 354  | 0.25        |
| 355       | 0.25        | 0.010  | 356  | 0.25        | 0.010  | 357  | 0.25        |
| 358       | 0.25        | 0.010  | 359  | 0.25        | 0.010  | 360  | 0.25        |
| 361       | 0.25        | 0.010  | 362  | 0.25        | 0.010  | 363  | 0.25        |
| 364       | 0.25        | 0.010  | 365  | 0.25        | 0.010  | 366  | 0.25        |
| 367       | 0.25        | 0.010  | 368  | 0.25        | 0.010  | 369  | 0.25        |
| 370       | 0.25        | 0.010  | 371  | 0.25        | 0.010  | 372  | 0.25        |
| 373       | 0.25        | 0.010  | 374  | 0.25        | 0.010  | 375  | 0.25        |
| 376       | 0.25        | 0.010  | 377  | 0.25        | 0.010  | 378  | 0.25        |
| 379       | 0.25        | 0.010  | 380  | 0.25        | 0.010  | 381  | 0.25        |
| 382       | 0.25        | 0.010  | 383  | 0.25        | 0.010  | 384  | 0.25        |
| 385       | 0.25        | 0.010  | 386  | 0.25        | 0.010  | 387  | 0.25        |
| 388       | 0.25        | 0.010  | 389  | 0.25        | 0.010  | 390  | 0.25        |
| 391       | 0.25        | 0.010  | 392  | 0.25        | 0.010  | 393  | 0.25        |
| 394       | 0.25        | 0.010  | 395  | 0.25        | 0.010  | 396  | 0.25        |
| 397       | 0.25        | 0.010  |      |             |        |      |             |

# High-Speed, Single-Supply, Quad, SPST Analog Switches

## Package Information (continued)

|    | INCHES |       | MILLIMETERS |      |
|----|--------|-------|-------------|------|
|    | MIN    | MAX   | MIN         | MAX  |
| A  | 0.053  | 0.069 | 1.35        | 1.75 |
| A1 | 0.004  | 0.010 | 0.10        | 0.25 |
| B  | 0.014  | 0.019 | 0.35        | 0.49 |
| C  | 0.007  | 0.010 | 0.19        | 0.25 |
| e  | 0.050  |       | 1.27        |      |
| E  | 0.150  | 0.157 | 3.80        | 4.00 |
| H  | 0.228  | 0.244 | 5.80        | 6.20 |
| h  | 0.010  | 0.020 | 0.25        | 0.50 |
| L  | 0.016  | 0.050 | 0.40        | 1.27 |

|   | INCHES |       | MILLIMETERS |       | N  | MS012 |
|---|--------|-------|-------------|-------|----|-------|
|   | MIN    | MAX   | MIN         | MAX   |    |       |
| D | 0.189  | 0.197 | 4.80        | 5.00  | 8  | A     |
| D | 0.337  | 0.344 | 8.55        | 8.75  | 14 | B     |
| D | 0.386  | 0.394 | 9.80        | 10.00 | 16 | C     |

NOTES:  
 1. D&E DO NOT INCLUDE MOLD FLASH  
 2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15mm (.006")  
 3. LEADS TO BE COPLANAR WITHIN .102mm (.004")  
 4. CONTROLLING DIMENSION: MILLIMETER  
 5. MEETS JEDEC MS012-XX AS SHOWN IN ABOVE TABLE  
 6. N = NUMBER OF PINS

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# **High-Speed, Single-Supply, Quad, SPST Analog Switches**

## **NOTES**

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**12** \_\_\_\_\_ **Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 408-737-7600**

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