

# MAXIM

## 1.25Ω, Dual SPST, CMOS Analog Switches

MAX4580/MAX4590/MAX4600

### General Description

The MAX4580/MAX4590/MAX4600 dual analog switches feature low on-resistance of 1.25Ω max. On-resistance is matched between switches to 0.25Ω max and is flat (0.3Ω max) over the specified signal range. Each switch can handle Rail-to-Rail® analog signals. The off-leakage current is only 2.5nA max at +85°C. These analog switches are ideal in low-distortion applications and are the preferred solution over mechanical relays in automatic test equipment or applications where current switching is required. They have low power requirements, require less board space, and are more reliable than mechanical relays.

The MAX4580 has two NC (normally closed) switches, the MAX4590 has two NO (normally open) switches, and the MAX4600 has one NC (normally closed) and one NO (normally open) switch.

These switches operate from a +4.5V to +36V single supply or from ±4.5V to ±20V dual supplies. All digital inputs have +0.8V and +2.4V logic thresholds, ensuring TTL/CMOS-logic compatibility when using a +12V single supply or ±15V dual supplies.

### Applications

- Reed Relay Replacement
- Test Equipment
- Communication Systems
- PBX, PABX Systems

### Features

- ◆ Low On-Resistance (1.25Ω max)
- ◆ Guaranteed R<sub>ON</sub> Match Between Channels (0.25Ω max)
- ◆ Guaranteed R<sub>ON</sub> Flatness Over Specified Signal Range (0.3Ω max)
- ◆ Rail-to-Rail Signal Handling
- ◆ Guaranteed ESD Protection >2kV per Method 3015.7
- ◆ Single-Supply Operation: +4.5V to +36V  
Dual-Supply Operation: ±4.5V to ±20V
- ◆ TTL/CMOS-Compatible Control Inputs

### Ordering Information

| PART       | TEMP RANGE     | PIN-PACKAGE    |
|------------|----------------|----------------|
| MAX4580CAE | 0°C to +70°C   | 16 SSOP        |
| MAX4580CWE | 0°C to +70°C   | 16 Wide SO     |
| MAX4580CPE | 0°C to +70°C   | 16 Plastic DIP |
| MAX4580EAE | -40°C to +85°C | 16 SSOP        |
| MAX4580EWE | -40°C to +85°C | 16 Wide SO     |
| MAX4580EPE | -40°C to +85°C | 16 Plastic DIP |

Ordering Information continued at end of data sheet.

### Pin Configurations/Functional Diagrams/Truth Tables

TOP VIEW

**MAX4580**

SSOP/SO/DIP

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

N.C. = NOT INTERNALLY CONNECTED

**MAX4590**

SSOP/SO/DIP

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

**MAX4600**

SSOP/SO/DIP

| LOGIC | SWITCH 1 | SWITCH 2 |
|-------|----------|----------|
| 0     | OFF      | ON       |
| 1     | ON       | OFF      |

Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd.



For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at [www.maxim-ic.com](http://www.maxim-ic.com).

# 1.25Ω, Dual SPST, CMOS Analog Switches

## ABSOLUTE MAXIMUM RATINGS

|                                                                                  |                            |                                                       |                 |
|----------------------------------------------------------------------------------|----------------------------|-------------------------------------------------------|-----------------|
| V+ to GND .....                                                                  | -0.3V to +44V              | Continuous Power Dissipation (T <sub>A</sub> = +70°C) |                 |
| V- to GND .....                                                                  | +0.3V to -44V              | 16 SSOP (derate 7.1mW/°C above +70°C) .....           | 571mW           |
| V+ to V- .....                                                                   | -0.3V to +44V              | 16 Wide SO (derate 9.52mW/°C above +70°C) .....       | 762mW           |
| V <sub>L</sub> to GND .....                                                      | -0.3V to (V+ + 0.3V)       | 16 Plastic DIP (derate 10.53mW/°C above +70°C) .....  | 842mW           |
| All Other Pins to GND (Note 1) .....                                             | (V- - 0.3V) to (V+ + 0.3V) | Operating Temperature Ranges                          |                 |
| Continuous Current (COM <sub>-</sub> , NO <sub>-</sub> , NC <sub>-</sub> ) ..... | ±200mA                     | MAX4 <sub>-</sub> _OC_E .....                         | 0°C to +70°C    |
| Peak Current (COM <sub>-</sub> , NO <sub>-</sub> , NC <sub>-</sub> )             |                            | MAX4 <sub>-</sub> _OE_E .....                         | -40°C to +85°C  |
| (pulsed at 1ms, 10% duty cycle) .....                                            | ±300mA                     | Storage Temperature Range .....                       | -65°C to +160°C |
|                                                                                  |                            | Lead Temperature (soldering, 10sec) .....             | +300°C          |

**Note 1:** Signals on NC<sub>-</sub>, NO<sub>-</sub>, COM<sub>-</sub>, or IN<sub>-</sub> 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—Dual Supplies

(V+ = +15V, V- = -15V, V<sub>L</sub> = +5V, V<sub>IN\_H</sub> = +2.4V, V<sub>IN\_L</sub> = +0.8V, T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub>, unless otherwise noted. Typical values are at T<sub>A</sub> = +25°C.)

| PARAMETER                                                                                                  | SYMBOL                                                                                      | CONDITIONS                                                                                                                | MIN    | TYP<br>(Note 2) | MAX   | UNITS |    |
|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------|-----------------|-------|-------|----|
| <b>ANALOG SWITCH</b>                                                                                       |                                                                                             |                                                                                                                           |        |                 |       |       |    |
| Input Voltage Range<br>(Note 3)                                                                            | V <sub>COM<sub>-</sub></sub> , V <sub>NO<sub>-</sub></sub> ,<br>V <sub>NC<sub>-</sub></sub> |                                                                                                                           | V-     |                 | V+    | V     |    |
| COM <sub>-</sub> to NO <sub>-</sub> or NC <sub>-</sub><br>On-Resistance                                    | R <sub>ON</sub>                                                                             | I <sub>COM<sub>-</sub></sub> = 10mA,<br>V <sub>NO<sub>-</sub></sub> or V <sub>NC<sub>-</sub></sub> = ±10V,                |        | 0.9             | 1.25  | Ω     |    |
|                                                                                                            |                                                                                             | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub>                                           |        |                 | 1.5   |       |    |
| COM <sub>-</sub> to NO <sub>-</sub> or NC <sub>-</sub><br>On-Resistance Match Between<br>Channels (Note 4) | ΔR <sub>ON</sub>                                                                            | I <sub>COM<sub>-</sub></sub> = 10mA,<br>V <sub>NO<sub>-</sub></sub> or V <sub>NC<sub>-</sub></sub> = ±10V                 |        | 0.05            | 0.25  | Ω     |    |
|                                                                                                            |                                                                                             | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub>                                           |        |                 | 0.5   |       |    |
| COM <sub>-</sub> to NO <sub>-</sub> or NC <sub>-</sub><br>On-Resistance Flatness<br>(Note 5)               | R <sub>FLAT(ON)</sub>                                                                       | I <sub>COM<sub>-</sub></sub> = 10mA; V <sub>NO<sub>-</sub></sub><br>or V <sub>NC<sub>-</sub></sub> = -5V, 0, +5V          |        | 0.06            | 0.3   | Ω     |    |
|                                                                                                            |                                                                                             | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub>                                           |        |                 | 0.5   |       |    |
| Off-Leakage Current<br>(NO <sub>-</sub> or NC <sub>-</sub> ) (Note 6)                                      | I <sub>NO<sub>-</sub></sub> , I <sub>NC<sub>-</sub></sub>                                   | V <sub>COM<sub>-</sub></sub> = ±10V,<br>V <sub>NO<sub>-</sub></sub> or V <sub>NC<sub>-</sub></sub> = ∓10V                 |        | -0.5            | 0.01  | 0.5   | nA |
|                                                                                                            |                                                                                             | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub>                                           |        | -2.5            |       | 2.5   |    |
| COM <sub>-</sub> Off-Leakage Current<br>(Note 6)                                                           | I <sub>COM<sub>-</sub>(OFF)</sub>                                                           | V <sub>COM<sub>-</sub></sub> = ±10V,<br>V <sub>NO<sub>-</sub></sub> or V <sub>NC<sub>-</sub></sub> = ∓10V                 |        | -0.5            | 0.01  | 0.5   | nA |
|                                                                                                            |                                                                                             | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub>                                           |        | -2.5            |       | 2.5   |    |
| COM <sub>-</sub> On-Leakage Current<br>(Note 6)                                                            | I <sub>COM<sub>-</sub>(ON)</sub>                                                            | V <sub>COM<sub>-</sub></sub> = ±10V,<br>V <sub>NO<sub>-</sub></sub> or V <sub>NC<sub>-</sub></sub> = ±10V,<br>or floating |        | -1              | 0.01  | 1     | nA |
|                                                                                                            |                                                                                             | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub>                                           |        | -5              |       | 5     |    |
| <b>LOGIC INPUT</b>                                                                                         |                                                                                             |                                                                                                                           |        |                 |       |       |    |
| Input Current with Input Voltage<br>High                                                                   | I <sub>IN_H</sub>                                                                           | IN <sub>-</sub> = 2.4V, all others = 0.8V                                                                                 | -0.500 | 0.001           | 0.500 | μA    |    |
| Input Current with Input Voltage<br>Low                                                                    | I <sub>IN_L</sub>                                                                           | IN <sub>-</sub> = 0.8V, all others = 2.4V                                                                                 | -0.500 | 0.001           | 0.500 |       |    |

# 1.25Ω, Dual SPST, CMOS Analog Switches

MAX4580/MAX4590/MAX4600

## ELECTRICAL CHARACTERISTICS—Dual Supplies (continued)

(V<sub>+</sub> = +15V, V<sub>-</sub> = -15V, V<sub>L</sub> = +5V, V<sub>IN\_H</sub> = +2.4V, V<sub>IN\_L</sub> = +0.8V, T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub>, unless otherwise noted. Typical values are at T<sub>A</sub> = +25°C.)

| PARAMETER                             | SYMBOL             | CONDITIONS                                                                                           | MIN                                                   | TYP<br>(Note 2) | MAX   | UNITS |    |
|---------------------------------------|--------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------|-------|-------|----|
| Logic Input High Voltage              | V <sub>IN_H</sub>  |                                                                                                      | 2.4                                                   | 1.7             |       | V     |    |
| Logic Input Low Voltage               | V <sub>IN_L</sub>  |                                                                                                      |                                                       | 1.7             | 0.8   | V     |    |
| <b>POWER SUPPLY</b>                   |                    |                                                                                                      |                                                       |                 |       |       |    |
| Power-Supply Range                    |                    |                                                                                                      | ±4.5                                                  |                 | ±20.0 | V     |    |
| Positive Supply Current               | I <sub>+</sub>     | V <sub>IN_</sub> = 0 or +5V                                                                          | T <sub>A</sub> = +25°C                                | -0.5            | 0.01  | 0.5   | μA |
|                                       |                    |                                                                                                      | T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub> | 5               |       | 5     |    |
| Negative Supply Current               | I <sub>-</sub>     | V <sub>IN_</sub> = 0 or +5V                                                                          | T <sub>A</sub> = +25°C                                | -0.5            | 0.01  | 0.5   | μA |
|                                       |                    |                                                                                                      | T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub> | 5               |       | 5     |    |
| Logic Supply Current                  | I <sub>L</sub>     | V <sub>IN_</sub> = 0 or +5V                                                                          | T <sub>A</sub> = +25°C                                | -0.5            | 0.01  | 0.5   | μA |
|                                       |                    |                                                                                                      | T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub> | 5               |       | 5     |    |
| Ground Current                        | I <sub>GND</sub>   | V <sub>IN_</sub> = 0 or +5V                                                                          | T <sub>A</sub> = +25°C                                | -0.5            | 0.01  | 0.5   | μA |
|                                       |                    |                                                                                                      | T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub> | 5               |       | 5     |    |
| <b>SWITCH DYNAMIC CHARACTERISTICS</b> |                    |                                                                                                      |                                                       |                 |       |       |    |
| Turn-On Time                          | t <sub>ON</sub>    | Figure 2, V <sub>COM_</sub> = ±10V, T <sub>A</sub> = +25°C                                           |                                                       | 160             |       | ns    |    |
| Turn-Off Time                         | t <sub>OFF</sub>   | Figure 2, V <sub>COM_</sub> = ±10V, T <sub>A</sub> = +25°C                                           |                                                       | 210             |       | ns    |    |
| Charge Injection                      | Q                  | C <sub>L</sub> = 1.0nF, V <sub>GEN</sub> = 0, R <sub>GEN</sub> = 0, Figure 3, T <sub>A</sub> = +25°C |                                                       | -60             |       | pC    |    |
| Off-Isolation (Note 7)                | V <sub>ISO</sub>   | R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF, f = 1MHz, Figure 4, T <sub>A</sub> = +25°C               |                                                       | -53             |       | dB    |    |
| Crosstalk (Note 8)                    | V <sub>CT</sub>    | R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF, f = 1MHz, Figure 5, T <sub>A</sub> = +25°C               |                                                       | -65             |       | dB    |    |
| NC_ or NO_ Capacitance                | C <sub>(OFF)</sub> | f = 1MHz, Figure 6, T <sub>A</sub> = +25°C                                                           |                                                       | 115             |       | pF    |    |
| COM Off-Capacitance                   | C <sub>(COM)</sub> | f = 1MHz, Figure 6, T <sub>A</sub> = +25°C                                                           |                                                       | 115             |       | pF    |    |
| On-Capacitance                        | C <sub>(COM)</sub> | f = 1MHz, Figure 7, T <sub>A</sub> = +25°C                                                           |                                                       | 520             |       | pF    |    |

# 1.25Ω, Dual SPST, CMOS Analog Switches

## ELECTRICAL CHARACTERISTICS—Single Supply

(V+ = +12V, V- = 0, VL = +5V, VINH = 2.4V, VINL = 0.8V, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.)

| PARAMETER                                                              | SYMBOL                              | CONDITIONS                                                                                         |                   | MIN    | TYP<br>(Note 2) | MAX   | UNITS |
|------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------|-------------------|--------|-----------------|-------|-------|
| <b>ANALOG SWITCH</b>                                                   |                                     |                                                                                                    |                   |        |                 |       |       |
| Input Voltage Range<br>(Note 3)                                        | VCOM_, VNO_,<br>VNC_                |                                                                                                    |                   | GND    |                 | V+    | V     |
| COM_ to NO_ or NC_<br>On-Resistance                                    | RON                                 | I <sub>COM_</sub> = 10mA,<br>V <sub>NO_</sub> or V <sub>NC_</sub> = +10V,<br>V+ = 12V              | TA = +25°C        |        | 1.6             | 3     | Ω     |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX |        |                 | 3.5   |       |
| COM_ to NO_ or NC_<br>On-Resistance Match Between<br>Channels (Note 4) | ΔRON                                | I <sub>COM_</sub> = 10mA, V <sub>NO_</sub><br>or V <sub>NC_</sub> = +10V                           | TA = +25°C        |        |                 | 0.4   | Ω     |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX |        |                 | 0.5   |       |
| COM_ to NO_ or NC_<br>On-Resistance Flatness<br>(Note 5)               | R <sub>FLAT(ON)</sub>               | I <sub>COM_</sub> = 10mA; V <sub>NO_</sub><br>or V <sub>NC_</sub> = +3V, +6V,<br>+9V               | TA = +25°C        |        |                 | 0.4   | Ω     |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX |        |                 | 0.5   |       |
| Off-Leakage Current<br>(NO_ or NC_) (Notes 6, 9)                       | I <sub>NO_</sub> , I <sub>NC_</sub> | V <sub>COM_</sub> = 1V, +10V;<br>V <sub>NO_</sub> or V <sub>NC_</sub> = +10V,<br>+1V               | TA = +25°C        | -0.5   | 0.01            | 0.5   | nA    |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX | -2.5   |                 | 2.5   |       |
| COM_ Off-Leakage Current<br>(Notes 6, 9)                               | I <sub>COM_(OFF)</sub>              | V <sub>NO_</sub> or V <sub>NC_</sub> = +10V,<br>+1V; V <sub>COM_</sub> = +1V,<br>+10V              | TA = +25°C        | -0.5   | 0.01            | 0.5   | nA    |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX | -2.5   |                 | 2.5   |       |
| COM_ On-Leakage Current<br>(Notes 6, 9)                                | I <sub>COM_(ON)</sub>               | V <sub>COM_</sub> = +1V, +10V;<br>V <sub>NO_</sub> or V <sub>NC_</sub> = +1V,<br>+10V, or floating | TA = +25°C        | -1     | 0.02            | 1     | nA    |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX | -10    |                 | 10    |       |
| <b>LOGIC INPUT</b>                                                     |                                     |                                                                                                    |                   |        |                 |       |       |
| Input Current with Input Voltage<br>High                               | I <sub>IN_L</sub>                   | IN_ = 0.8V, all others = 2.4V                                                                      |                   | -0.500 | 0.001           | 0.500 | μA    |
| Input Current with Input Voltage<br>Low                                | I <sub>IN_H</sub>                   | IN_ = 2.4V, all others = 0.8V                                                                      |                   | -0.500 | 0.001           | 0.500 | μA    |
| Logic Input High Voltage                                               | V <sub>IN_H</sub>                   |                                                                                                    |                   | 2.4    |                 |       | V     |
| Logic Input Low Voltage                                                | V <sub>IN_L</sub>                   |                                                                                                    |                   |        |                 | 0.8   | V     |
| <b>POWER SUPPLY</b>                                                    |                                     |                                                                                                    |                   |        |                 |       |       |
| Power-Supply Range                                                     |                                     |                                                                                                    |                   | +4.5   |                 | +36.0 | V     |
| Positive Supply Current                                                | I+                                  | V <sub>IN_</sub> = 0 or +5V                                                                        | TA = +25°C        | -0.5   | 0.001           | 0.5   | μA    |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX | 5      |                 | 5     |       |
| Logic Supply Current                                                   | I <sub>L</sub>                      | V <sub>IN_</sub> = 0 or +5V                                                                        | TA = +25°C        | -0.5   | 0.001           | 0.5   | μA    |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX | 5      |                 | 5     |       |
| Ground Current                                                         | I <sub>GND</sub>                    | V <sub>IN_</sub> = 0 or +5V                                                                        | TA = +25°C        | -0.5   | 0.001           | 0.5   | μA    |
|                                                                        |                                     |                                                                                                    | TA = TMIN to TMAX | 5      |                 | 5     |       |

# 1.25Ω, Dual SPST, CMOS Analog Switches

## ELECTRICAL CHARACTERISTICS—Single Supply (continued)

(V+ = +12V, V- = 0, VL = +5V, VIN\_H = 2.4V, VIN\_L = 0.8V, TA = TMIN to TMAX, unless otherwise noted. Typical values are at TA = +25°C.)

| PARAMETER                             | SYMBOL  | CONDITIONS                                           | MIN | TYP<br>(Note 2) | MAX | UNITS |
|---------------------------------------|---------|------------------------------------------------------|-----|-----------------|-----|-------|
| <b>SWITCH DYNAMIC CHARACTERISTICS</b> |         |                                                      |     |                 |     |       |
| Turn-On Time                          | tON     | VCOM_ = +10V, Figure 2, TA = +25°C                   |     | 150             |     | ns    |
| Turn-Off Time                         | tOFF    | VCOM_ = +10V, Figure 2, TA = +25°C                   |     | 200             |     | ns    |
| Charge Injection                      | Q       | CL = 1.0nF, VGEN = 0, RGEN = 0, Figure 3, TA = +25°C |     | 40              |     | pC    |
| Crosstalk (Note 8)                    | VCT     | RL = 50Ω, CL = 5pF, f = 1MHz, Figure 5, TA = +25°C   |     | -65             |     | dB    |
| NC_ or NO_ Capacitance                | C(OFF)_ | f = 1MHz, Figure 6, TA = +25°C                       |     | 175             |     | pF    |
| COM Off-Capacitance                   | C(COM)_ | f = 1MHz, Figure 6, TA = +25°C                       |     | 175             |     | pF    |
| On-Capacitance                        | C(COM)_ | f = 1MHz, Figure 7, TA = +25°C                       |     | 275             |     | pF    |

**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:**  $\Delta R_{ON} = R_{ON(MAX)} - R_{ON(MIN)}$ .

**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 =  $20 \log_{10} [V_{COM} / (V_{NC} \text{ or } V_{NO})]$ , VCOM = output, VNC or VNO = input to off switch.

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

**Note 9:** Leakage testing at single supply is guaranteed by testing with dual supplies.

## Typical Operating Characteristics

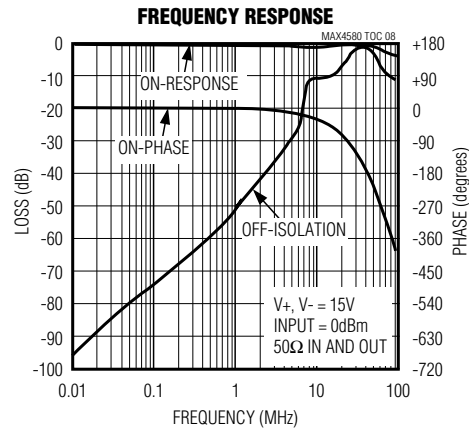
(Circuit of Figure 1, TA = +25°C, unless otherwise noted.)



# 1.25Ω, Dual SPST, CMOS Analog Switches

## Typical Operating Characteristics (continued)

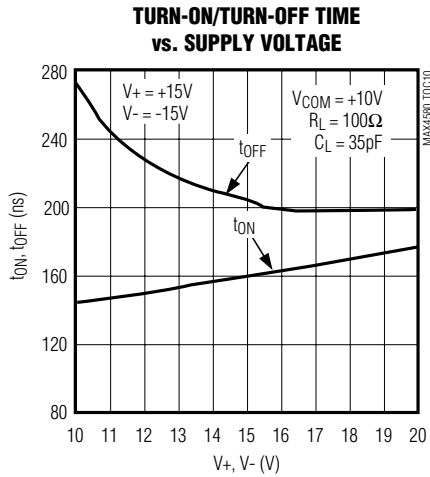
(Circuit of Figure 1,  $T_A = +25^\circ\text{C}$ , unless otherwise noted.)



# 1.25Ω, Dual SPST, CMOS Analog Switches

## Typical Operating Characteristics (continued)

(Circuit of Figure 1,  $T_A = +25^\circ\text{C}$ , unless otherwise noted.)



## Pin Description

| PIN                |                    |                    | NAME       | FUNCTION                                                                                                    |
|--------------------|--------------------|--------------------|------------|-------------------------------------------------------------------------------------------------------------|
| MAX4580            | MAX4590            | MAX4600            |            |                                                                                                             |
| 1, 3, 6, 8, 10, 15 | 1, 3, 6, 8, 10, 15 | 1, 3, 6, 8, 10, 15 | N.C.       | No connection. Not internally connected. Connect to GND or low-impedance point to improve on/off-isolation. |
| 2, 7               | 2, 7               | 2, 7               | IN1, IN2   | Logic-Control Digital Inputs                                                                                |
| 4                  | 4                  | 4                  | V-         | Negative Analog Supply Voltage Input. Connect to GND for single-supply operation.                           |
| 5                  | 5                  | 5                  | GND        | Ground                                                                                                      |
| 12                 | 12                 | 12                 | $V_L$      | Logic Supply Input                                                                                          |
| 13                 | 13                 | 13                 | V+         | Positive Analog Supply Input                                                                                |
| 14, 11             | 14, 11             | 14, 11             | COM1, COM2 | Analog Switch Common Terminals                                                                              |
| 16, 9              | –                  | –                  | NC1, NC2   | Analog Switch Normally Closed Terminals                                                                     |
| –                  | 16, 9              | –                  | NO1, NO2   | Analog Switch Normally Open Terminals                                                                       |
| –                  | –                  | 9                  | NC1        | Analog Switch Normally Closed Terminal                                                                      |
| –                  | –                  | 16                 | NO1        | Analog Switch Normally Open Terminal                                                                        |

# 1.25Ω, Dual SPST, CMOS Analog Switches

## 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 can cause permanent damage to the devices. Always sequence V+ on first, then V-, followed by the logic inputs, NO, or COM. If power-supply sequencing is not possible, add two small signal diodes (D1, D2) in series with supply pins for overvoltage protection (Figure 1). Adding diodes reduces the analog signal range to one diode drop below V+ and one diode drop above V-, but does not affect the devices' low switch resistance and low leakage characteristics. Device operation is unchanged, and the difference between V+ and V- should not exceed 44V. These protection diodes are not recommended when using a single supply.



Figure 1. Overvoltage Protection Using External Blocking Diodes



Figure 2. Switching-Time Test Circuit



# 1.25Ω, Dual SPST, CMOS Analog Switches

MAX4580/MAX4590/MAX4600



Figure 3. Charge-Injection Test Circuit



Figure 4. Off-Isolation Test Circuit



Figure 5. Crosstalk Test Circuit

# 1.25Ω, Dual SPST, CMOS Analog Switches



Figure 6. Switch Off-Capacitance Test Circuit



Figure 7. Switch On-Capacitance Test Circuit

## Ordering Information (continued)

| PART              | TEMP RANGE     | PIN-PACKAGE    |
|-------------------|----------------|----------------|
| <b>MAX4590CAE</b> | 0°C to +70°C   | 16 SSOP        |
| MAX4590CWE        | 0°C to +70°C   | 16 Wide SO     |
| MAX4590CPE        | 0°C to +70°C   | 16 Plastic DIP |
| MAX4590EAE        | -40°C to +85°C | 16 SSOP        |
| MAX4590EWE        | -40°C to +85°C | 16 Wide SO     |
| MAX4590EPE        | -40°C to +85°C | 16 Plastic DIP |
| <b>MAX4600CAE</b> | 0°C to +70°C   | 16 SSOP        |
| MAX4600CWE        | 0°C to +70°C   | 16 Wide SO     |
| MAX4600CPE        | 0°C to +70°C   | 16 Plastic DIP |
| MAX4600EAE        | -40°C to +85°C | 16 SSOP        |
| MAX4600EWE        | -40°C to +85°C | 16 Wide SO     |
| MAX4600EPE        | -40°C to +85°C | 16 Plastic DIP |

## Chip Information

TRANSISTOR COUNT: 100

# 1.25Ω, Dual SPST, CMOS Analog Switches

## Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)

MAX4580/MAX4590/MAX4600

| DIM | INCHES         |       | MILLIMETERS |      |
|-----|----------------|-------|-------------|------|
|     | MIN            | MAX   | MIN         | MAX  |
| A   | 0.068          | 0.078 | 1.73        | 1.99 |
| A1  | 0.002          | 0.008 | 0.05        | 0.21 |
| B   | 0.010          | 0.015 | 0.25        | 0.38 |
| C   | 0.004          | 0.008 | 0.09        | 0.20 |
| D   | SEE VARIATIONS |       |             |      |
| E   | 0.205          | 0.212 | 5.20        | 5.38 |
| e   | 0.0256 BSC     |       | 0.65 BSC    |      |
| H   | 0.301          | 0.311 | 7.65        | 7.90 |
| L   | 0.025          | 0.037 | 0.63        | 0.95 |
| α   | 0°             | 8°    | 0°          | 8°   |

| D | INCHES |       | MILLIMETERS |       | N   |
|---|--------|-------|-------------|-------|-----|
|   | MIN    | MAX   | MIN         | MAX   |     |
| D | 0.239  | 0.249 | 6.07        | 6.33  | 14L |
| D | 0.239  | 0.249 | 6.07        | 6.33  | 16L |
| D | 0.278  | 0.289 | 7.07        | 7.33  | 20L |
| D | 0.317  | 0.328 | 8.07        | 8.33  | 24L |
| D | 0.397  | 0.407 | 10.07       | 10.33 | 28L |

**NOTES:**

- D & E DO NOT INCLUDE MOLD FLASH.
- MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15 MM (.006").
- CONTROLLING DIMENSION: MILLIMETERS.
- MEETS JEDEC MO150.
- LEADS TO BE COPLANAR WITHIN 0.10 MM.

**DALLAS SEMICONDUCTOR** **MAXIM**

PROPRIETARY INFORMATION

TITLE: PACKAGE OUTLINE, SSOP, 5.3 MM

|          |                                 |            |
|----------|---------------------------------|------------|
| APPROVAL | DOCUMENT CONTROL NO.<br>21-0056 | REV. C 1/1 |
|----------|---------------------------------|------------|

# 1.25Ω, Dual SPST, CMOS Analog Switches

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)

TOP VIEW

FRONT VIEW

SIDE VIEW

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.093  | 0.104 | 2.35        | 2.65  |
| A1  | 0.004  | 0.012 | 0.10        | 0.30  |
| B   | 0.014  | 0.019 | 0.35        | 0.49  |
| C   | 0.009  | 0.013 | 0.23        | 0.32  |
| e   | 0.050  |       | 1.27        |       |
| E   | 0.291  | 0.299 | 7.40        | 7.60  |
| H   | 0.394  | 0.419 | 10.00       | 10.65 |
| L   | 0.016  | 0.050 | 0.40        | 1.27  |

VARIATIONS:

| DIM | INCHES |       | MILLIMETERS |       | N  | MS013 |
|-----|--------|-------|-------------|-------|----|-------|
|     | MIN    | MAX   | MIN         | MAX   |    |       |
| D   | 0.398  | 0.413 | 10.10       | 10.50 | 16 | AA    |
| D   | 0.447  | 0.463 | 11.35       | 11.75 | 18 | AB    |
| D   | 0.496  | 0.512 | 12.60       | 13.00 | 20 | AC    |
| D   | 0.598  | 0.614 | 15.20       | 15.60 | 24 | AD    |
| D   | 0.697  | 0.713 | 17.70       | 18.10 | 28 | AE    |

NOTES:

1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm (.006").
3. LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
4. CONTROLLING DIMENSION: MILLIMETERS.
5. MEETS JEDEC MS013.
6. N = NUMBER OF PINS.

**DALLAS SEMICONDUCTOR** **MAXIM**

PROPRIETARY INFORMATION

TITLE:  
PACKAGE OUTLINE, .300" SOIC

|          |                                        |      |     |
|----------|----------------------------------------|------|-----|
| APPROVAL | DOCUMENT CONTROL NO.<br><b>21-0042</b> | REV. | 1/1 |
|----------|----------------------------------------|------|-----|

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