

# MAX14752/MAX14753

# 8-Channel/Dual 4-Channel 72V Analog Multiplexers

## General Description

The MAX14752/MAX14753 are 8-to-1 and dual 4-to-1 high-voltage analog multiplexers. Both devices feature  $60\Omega$  (typ) on-resistance with  $0.03\Omega$  (typ) on-resistance flatness. These low on-resistance multiplexers conduct equally well in either direction. Flexible logic levels for the channel-select interface are defined by the EN input.

The MAX14752 is a 8-to-1 multiplexer and MAX14753 is a dual 4-to-1 multiplexer. Both devices operate with dual supplies of  $\pm 10V$  to  $\pm 36V$ , or a single supply of  $+20V$  to  $+72V$ .

The MAX14752/MAX14753 are available in a 16-pin TSSOP package and are pin compatible with the industry-standard DG408/DG409. Both the MAX14752/MAX14753 are specified over the extended  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  operating temperature range.

## Applications

Programmable-Logic Controllers  
Environment Control Systems  
ATE Systems  
Medical Monitoring Systems

## Benefits and Features

- Supply Range Accommodates Wide Voltage Applications
  - Wide  $\pm 36V$  (max) Bipolar Power Supply
  - High  $+72V$  (max) Single Power Supply
  - Asymmetric Bipolar Power Supply Operation
- Low Leakage Current and  $R_{ON}$  Improves System Accuracy
  - Low On-Resistance  $60\Omega$  (typ)
  - $0.03\Omega$  (typ)  $R_{ON}$  Flatness Over Common-Mode Voltage Range
  - $20nA$  Low-Input, On-Leakage Current (max)
- Low  $25\mu A$   $I_{DD}$  Supply Current in Disable Mode Saves Power
- Easy to Upgrade with Pin-Compatible, Industry-Standard DG408/DG409

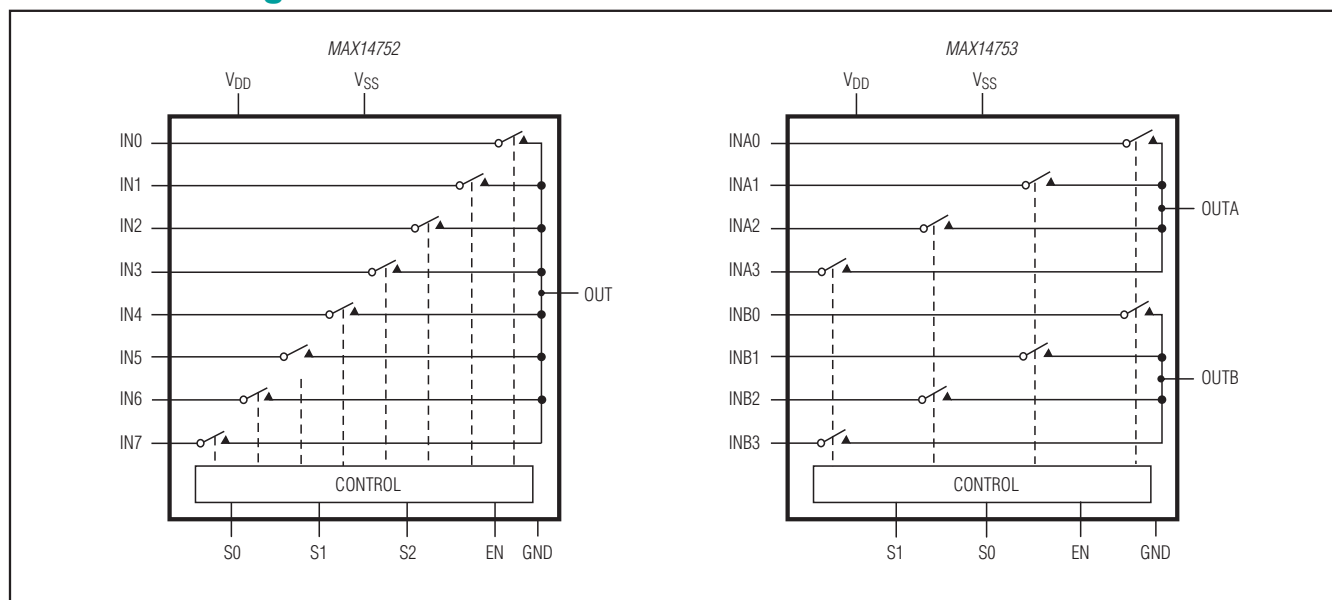
## Ordering Information

| PART         | TEMP RANGE                                     | PIN-PACKAGE |
|--------------|------------------------------------------------|-------------|
| MAX14752EUE+ | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 16 TSSOP    |
| MAX14753EUE+ | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 16 TSSOP    |

+Denotes a lead(Pb)-free/RoHS-compliant package.

Pin Configurations appear at end of data sheet.

## Functional Diagrams



## Absolute Maximum Ratings

$V_{DD}$  to  $V_{SS}$  ..... -0.3V to +72V  
 $GND$  to  $V_{SS}$  ..... -0.3V to  $V_{DD}$   
 $EN, S0, S1, S2$  to  $GND$  .....  
 ..... -0.3V to the lesser of (+12V and  $V_{DD} + 0.3V$ )  
 $IN_-, INA_-, INB_-, OUT, OUTA, OUTB$  to  $V_{SS}$  .....  
 ..... -2V to ( $V_{DD} - V_{SS} + 2V$ ) or 100mA (whichever occurs first)  
 Continuous Current into  $IN_-, INA_-,$   
 $INB_-, OUT, OUTA, OUTB$  ..... 100mA  
 Continuous Power Dissipation ( $T_A = +70^\circ C$ )  
 16-Pin TSSOP (derate 11.1mW/ $^\circ C$  above  $+70^\circ C$ ) ..... 890mW

Junction-to-Ambient Thermal Resistance ( $\theta_{JA}$ ) (Note 1)  
 16-Pin TSSOP ..... 90 $^\circ C/W$   
 Junction-to-Case Thermal Resistance ( $\theta_{JC}$ ) (Note 1)  
 16-Pin TSSOP ..... 27 $^\circ C/W$   
 Maximum Operating Temperature Range ..... -40 $^\circ C$  to +125 $^\circ C$   
 Junction Temperature ..... +150 $^\circ C$   
 Storage Temperature Range ..... -65 $^\circ C$  to +150 $^\circ C$   
 Lead Temperature (soldering, 10s) ..... +300 $^\circ C$   
 Soldering Temperature (reflow) ..... +260 $^\circ C$

**Note 1:** Package thermal resistances were obtained using the method described in JEDEC specification JESD51-7, using a four-layer board. For detailed information on package thermal considerations, refer to [www.maximintegrated.com/thermal-tutorial](http://www.maximintegrated.com/thermal-tutorial).

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.

## DC Electrical Characteristics—Dual Supplies

( $V_{DD} = +35V$ ,  $V_{SS} = -35V$ ,  $V_{GND} = 0V$ ,  $V_{EN} = +3.3V$ ,  $T_A = -40^\circ C$  to  $+85^\circ C$ , unless otherwise noted. Typical values are at  $T_A = +25^\circ C$ .)

| PARAMETER                                  | SYMBOL                                                                                                                    | CONDITIONS                                                                                                                                                                                              | MIN             | TYP  | MAX             | UNITS |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|-----------------|-------|
| POWER SUPPLY                               |                                                                                                                           |                                                                                                                                                                                                         |                 |      |                 |       |
| V <sub>DD</sub> Supply Voltage Range       | V <sub>DD</sub>                                                                                                           |                                                                                                                                                                                                         | +10             |      | +36             | V     |
| V <sub>SS</sub> Supply Voltage Range       | V <sub>SS</sub>                                                                                                           |                                                                                                                                                                                                         | -10             |      | -36             | V     |
| V <sub>DD</sub> Supply Current             | I <sub>DD</sub> (OFF)                                                                                                     | V <sub>EN</sub> = V <sub>S_</sub> = 0V, V <sub>IN_</sub> = V <sub>INA_</sub> = V <sub>INB_</sub> = +20V                                                                                                 |                 | 12   | 25              | μA    |
|                                            | I <sub>DD</sub> (ON)                                                                                                      | V <sub>EN</sub> = +5V, V <sub>S_</sub> = 0V or V <sub>EN</sub> , V <sub>IN_</sub> = V <sub>INA_</sub> = V <sub>INB_</sub> = +20V                                                                        |                 | 270  | 600             |       |
| V <sub>SS</sub> Supply Current             | I <sub>SS</sub> (OFF)                                                                                                     | V <sub>EN</sub> = V <sub>S_</sub> = 0V, V <sub>IN_</sub> = V <sub>INA_</sub> = V <sub>INB_</sub> = +20V                                                                                                 |                 | 11   | 25              | μA    |
|                                            | I <sub>SS</sub> (ON)                                                                                                      | V <sub>EN</sub> = +5V, V <sub>S_</sub> = 0V or V <sub>EN</sub> , V <sub>IN_</sub> = V <sub>INA_</sub> = V <sub>INB_</sub> = +20V                                                                        |                 | 260  | 600             |       |
| ANALOG MUX                                 |                                                                                                                           |                                                                                                                                                                                                         |                 |      |                 |       |
| Analog Signal Range                        | V <sub>IN_</sub> , V <sub>INA_</sub> ,<br>V <sub>INB_</sub> , V <sub>OUT</sub> ,<br>V <sub>OUTA</sub> , V <sub>OUTB</sub> |                                                                                                                                                                                                         | V <sub>SS</sub> |      | V <sub>DD</sub> | V     |
| Current Through Multiplexer                | I <sub>IN_</sub> , I <sub>INA_</sub> ,<br>I <sub>INB_</sub>                                                               | V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = ±20V                                                                                                                                         | -5              |      | +5              | mA    |
| On-Resistance                              | R <sub>ON</sub>                                                                                                           | I <sub>IN_</sub> , I <sub>INA_</sub> , I <sub>INB_</sub> = 5mA; V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> ,<br>V <sub>OUT</sub> , V <sub>OUTA</sub> , V <sub>OUTB</sub> = ±20V, Figure 1 |                 | 60   | 130             | Ω     |
| On-Resistance Matching<br>Between Channels | ΔR <sub>ON</sub>                                                                                                          | I <sub>IN_</sub> , I <sub>INA_</sub> , I <sub>INB_</sub> = 5mA, V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> =<br>±20V, 0V                                                                  |                 | 0.5  |                 | Ω     |
| On-Resistance Flatness                     | R <sub>FLAT_</sub> (ON)                                                                                                   | I <sub>IN_</sub> , I <sub>INA_</sub> , I <sub>INB_</sub> = 5mA, V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> ,<br>V <sub>OUT</sub> , V <sub>OUTA</sub> , V <sub>OUTB</sub> = ±20V           |                 | 0.03 |                 | Ω     |
| Output On-Leakage Current                  | I <sub>OUT</sub> (ON)                                                                                                     | MAX14752: V <sub>OUT</sub> , V <sub>OUTA</sub> , V <sub>OUTB</sub> = ±20V,<br>V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = unconnected, Figure 2                                          | -20             |      | +20             | nA    |
|                                            |                                                                                                                           | MAX14753: V <sub>OUT</sub> , V <sub>OUTA</sub> , V <sub>OUTB</sub> = ±20V,<br>V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = unconnected, Figure 2                                          | -10             |      | +10             |       |

**DC Electrical Characteristics—Dual Supplies (continued)**(V<sub>DD</sub> = +35V, V<sub>SS</sub> = -35V, V<sub>GND</sub> = 0V, V<sub>EN</sub> = +3.3V, T<sub>A</sub> = -40°C to +85°C, unless otherwise noted. Typical values are at T<sub>A</sub> = +25°C.)

| PARAMETER                            | SYMBOL                            | CONDITIONS                                                                                                                                           | MIN                    | TYP    | MAX                    | UNITS |
|--------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------|------------------------|-------|
| Output Off-Leakage Current           | I <sub>OUT(OFF)</sub>             | MAX14752: V <sub>OUT</sub> , V <sub>OUTA</sub> , V <sub>OUTB</sub> = ±20V, V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = -20V, Figure 3 | -20                    |        | +20                    | nA    |
|                                      |                                   | MAX14753: V <sub>OUT</sub> , V <sub>OUTA</sub> , V <sub>OUTB</sub> = ±40V, V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = -40V, Figure 3 | -10                    |        | +10                    |       |
| Input Off-Leakage Current            | I <sub>IN(OFF)</sub>              | V <sub>OUT</sub> , V <sub>OUTA</sub> , V <sub>OUTB</sub> = ±20V, V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = ±20V, Figure 3           | -5                     |        | +5                     | nA    |
| <b>LOGIC (EN, S0, S1, S2)</b>        |                                   |                                                                                                                                                      |                        |        |                        |       |
| EN Input Voltage Low                 | V <sub>EN_IL</sub>                |                                                                                                                                                      |                        |        | 0.8                    | V     |
| EN Input Voltage High                | V <sub>EN_IH</sub>                |                                                                                                                                                      | 2.1                    |        |                        | V     |
| EN, S_ Input Voltage Range           | V <sub>EN</sub> , V <sub>S_</sub> |                                                                                                                                                      |                        |        | 11                     | V     |
| EN Input Current                     | I <sub>EN_IH(DC)</sub>            | V <sub>EN</sub> = +11V, V <sub>S0</sub> = V <sub>S1</sub> = V <sub>S2</sub> = (0.25 × V <sub>EN</sub> ) or (0.75 × V <sub>EN</sub> )                 |                        |        | 0.4                    | mA    |
| S0, S1, S2 Input Voltage Low         | V <sub>IL</sub>                   |                                                                                                                                                      |                        |        | 0.25 × V <sub>EN</sub> | V     |
| S0, S1, S2 Input Voltage High        | V <sub>IH</sub>                   |                                                                                                                                                      | 0.75 × V <sub>EN</sub> |        |                        | V     |
| <b>DYNAMIC CHARACTERISTICS</b>       |                                   |                                                                                                                                                      |                        |        |                        |       |
| Enable Turn-On Time                  | t <sub>ON</sub>                   | V <sub>IN0</sub> , V <sub>INA0</sub> = ±10V, R <sub>L</sub> = 10kΩ, Figure 4                                                                         |                        | 1      | 25                     | μs    |
| Enable Turn-Off Time                 | t <sub>OFF</sub>                  | V <sub>IN0</sub> , V <sub>INA0</sub> = ±10V, R <sub>L</sub> = 10kΩ, Figure 4                                                                         |                        | 0.8    | 2                      | μs    |
| Transition Time                      | t <sub>TRANS</sub>                | V <sub>IN0</sub> , V <sub>INA0</sub> = ±10V, R <sub>L</sub> = 10kΩ, Figure 5                                                                         |                        | 10     |                        | μs    |
| Break-Before-Make Time Delay         | t <sub>BBM</sub>                  | V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = ±10V, R <sub>L</sub> = 10kΩ, Figure 6                                                     |                        | 10     |                        | μs    |
| Frequency Response                   | BW                                | R <sub>S</sub> = 50Ω, R <sub>L</sub> = 1kΩ, Figure 7                                                                                                 |                        |        | 20                     | MHz   |
| Off-Isolation                        | V <sub>ISO</sub>                  | V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = 1V <sub>RMS</sub> , f = 100kHz, R <sub>L</sub> = 50Ω, C <sub>L</sub> = 15pF, Figure 8     |                        | 65     |                        | dB    |
| Crosstalk                            | V <sub>CT</sub>                   | R <sub>S</sub> = R <sub>L</sub> = 50Ω, Figure 9                                                                                                      |                        | 62     |                        | dB    |
| Total Harmonic Distortion Plus Noise | THD+N                             | R <sub>S</sub> = R <sub>L</sub> = 1kΩ, f = 20Hz to 20kHz                                                                                             |                        | 0.0014 |                        | %     |
| Charge Injection                     | Q                                 | V <sub>IN_</sub> , V <sub>INA_</sub> , V <sub>INB_</sub> = GND, C <sub>L</sub> = 1nF, Figure 10                                                      |                        | 200    |                        | pC    |

**DC Electrical Characteristics—Single Supply**(V<sub>DD</sub> = +70V, V<sub>SS</sub> = V<sub>GND</sub> = 0V, V<sub>EN</sub> = +3.3V, T<sub>A</sub> = -40°C to +85°C, unless otherwise noted. Typical values are at T<sub>A</sub> = +25°C.) (Note 2)

| PARAMETER                           | SYMBOL                                                                  | CONDITIONS                                                                                                                                                                               | MIN                                           | TYP | MAX | UNITS |
|-------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----|-----|-------|
| On-Resistance                       | R <sub>ON</sub>                                                         | I <sub>IN_</sub> = 5mA, V <sub>IN_</sub> , V <sub>OUT</sub> = +20V (MAX14752), V <sub>INA_</sub> , V <sub>OUTA</sub> , V <sub>INB_</sub> , V <sub>OUTB</sub> = +20V (MAX14753), Figure 1 |                                               | 60  | 130 |       |
| OUT, OUTA, OUTB Off-Leakage Current | I <sub>OUT(OFF)</sub> , I <sub>OUTA(OFF)</sub> , I <sub>OUTB(OFF)</sub> | MAX14752: V <sub>OUT</sub> = +40V, V <sub>IN_</sub> = V <sub>INA_</sub> = V <sub>INB_</sub> = +10V, Figure 3                                                                             | 20                                            |     | +20 | nA    |
|                                     |                                                                         | MAX14753: V <sub>OUT</sub> = +40V, V <sub>IN_</sub> = V <sub>INA_</sub> = V <sub>INB_</sub> = +10V, Figure 3                                                                             | -10                                           |     | +10 |       |
| On-Input Capacitance                | C <sub>IN_ON</sub>                                                      | MAX14752, V <sub>DD</sub> = +50V, OUT unconnected                                                                                                                                        | V <sub>IN_</sub> = 4V                         | 43  |     | pF    |
|                                     |                                                                         |                                                                                                                                                                                          | V <sub>IN_</sub> = 25V                        | 26  |     |       |
|                                     |                                                                         | MAX14753, V <sub>DD</sub> = +50V, OUTA, OUTB unconnected                                                                                                                                 | V <sub>INA_</sub> , V <sub>INB_</sub> = 4V    | 26  |     |       |
|                                     |                                                                         |                                                                                                                                                                                          | V <sub>INA_</sub> , V <sub>INB_</sub> = 25V   | 16  |     |       |
| Off-Input Capacitance               | C <sub>IN_OFF</sub>                                                     | MAX14752, V <sub>DD</sub> = +50V                                                                                                                                                         | V <sub>IN_</sub> = 4V                         | 6   |     | pF    |
|                                     |                                                                         |                                                                                                                                                                                          | V <sub>IN_</sub> = 25V                        | 3.7 |     |       |
|                                     |                                                                         | MAX14753, V <sub>DD</sub> = +50V                                                                                                                                                         | V <sub>INA_</sub> , V <sub>INB_</sub> = 4V    | 6   |     |       |
|                                     |                                                                         |                                                                                                                                                                                          | V <sub>INA_</sub> , V <sub>INB_</sub> = 25V   | 3.7 |     |       |
| Off-Output Capacitance              | C <sub>OUT_OFF</sub>                                                    | MAX14752, V <sub>DD</sub> = +50V                                                                                                                                                         | V <sub>OUT_</sub> = 4V                        | 35  |     | pF    |
|                                     |                                                                         |                                                                                                                                                                                          | V <sub>OUT_</sub> = 25V                       | 20  |     |       |
|                                     |                                                                         | MAX14753, V <sub>DD</sub> = +50V                                                                                                                                                         | V <sub>OUTA_</sub> , V <sub>OUTB_</sub> = 4V  | 19  |     |       |
|                                     |                                                                         |                                                                                                                                                                                          | V <sub>OUTA_</sub> , V <sub>OUTB_</sub> = 25V | 11  |     |       |

**Note 2:** All parameters in single-supply operation are expected to be the same as in dual-supplies operation.**Note 3:** IN-OUT capacitances are negligible (< 1pF).

Test Circuits/Timing Diagrams/Truth Tables

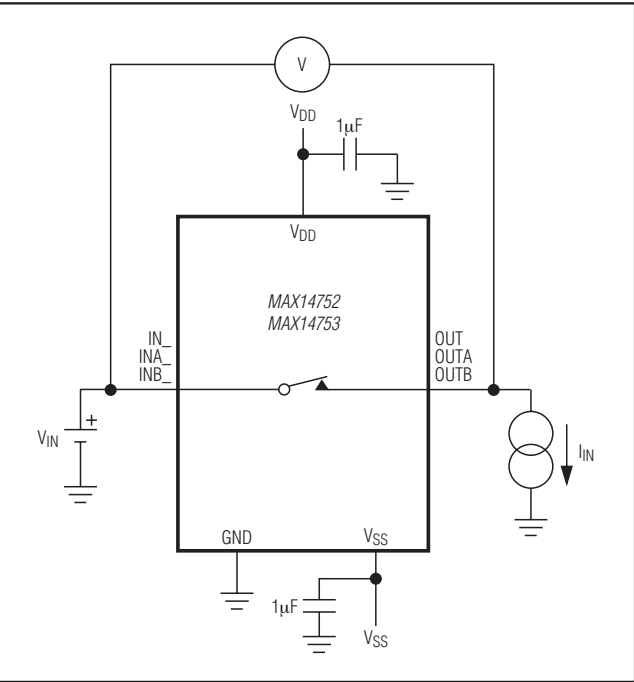


Figure 1. On-Resistance

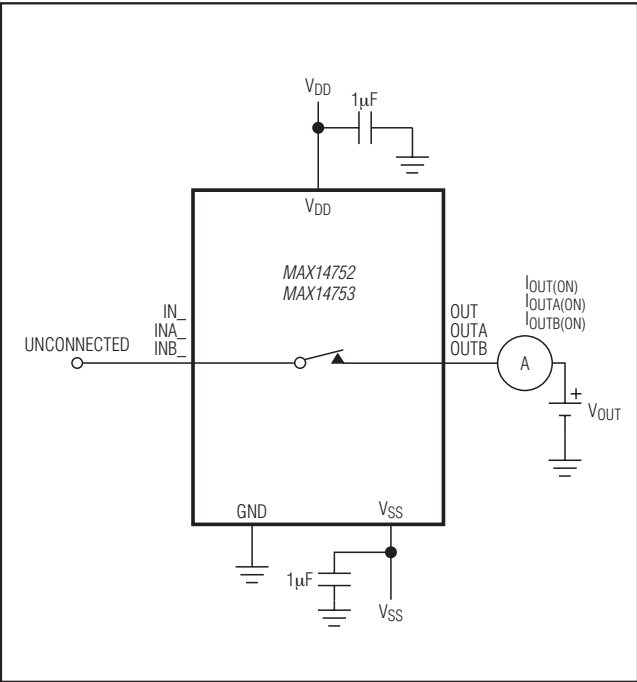


Figure 2. On-Leakage Current

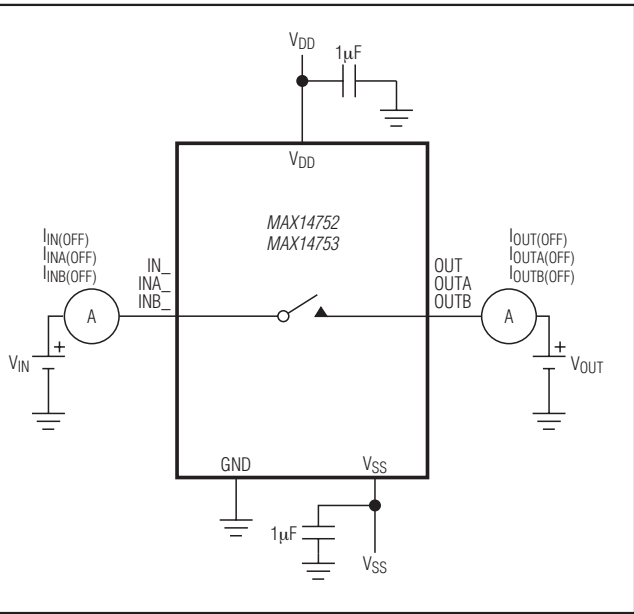
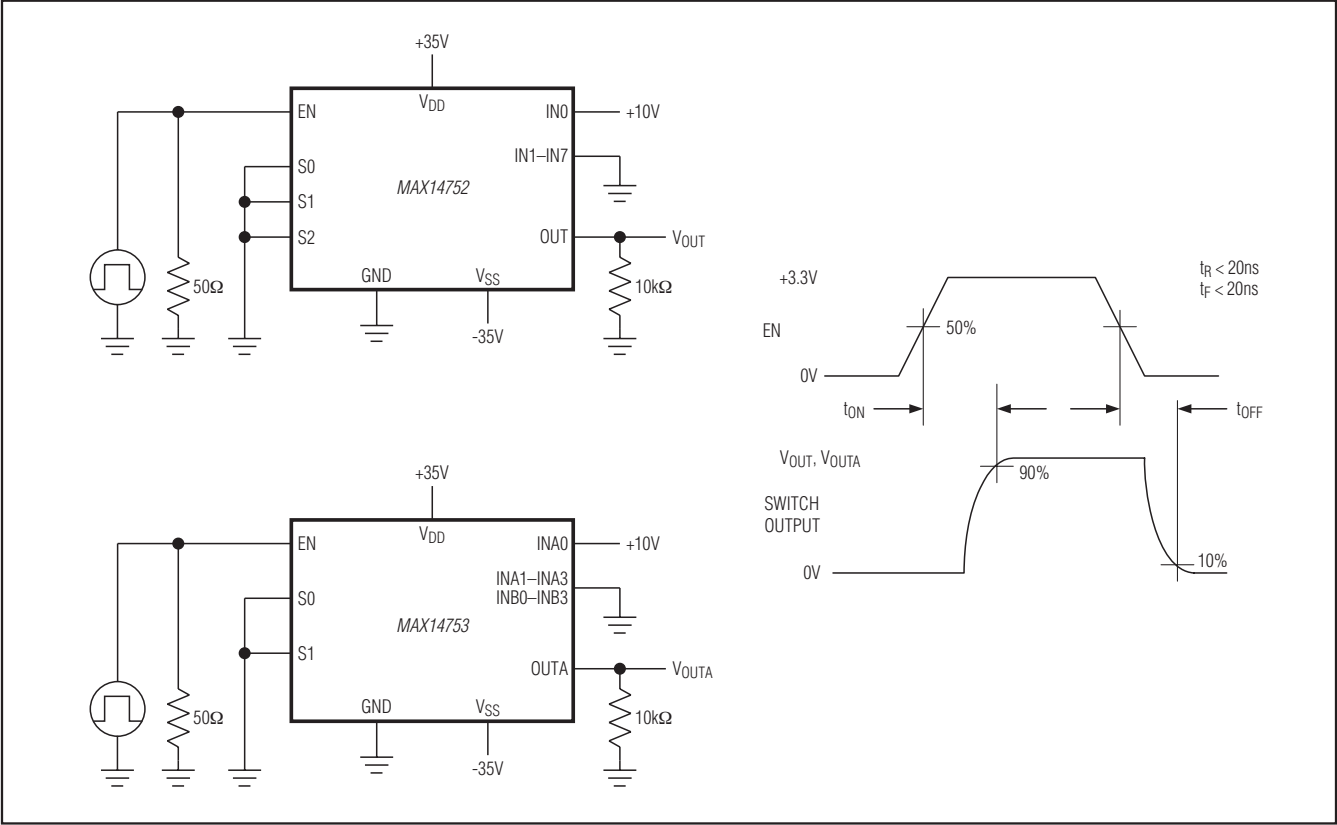


Figure 3. Off-Leakage Current

Test Circuits/Timing Diagrams/Truth Tables (continued)



## Test Circuits/Timing Diagrams/Truth Tables (continued)

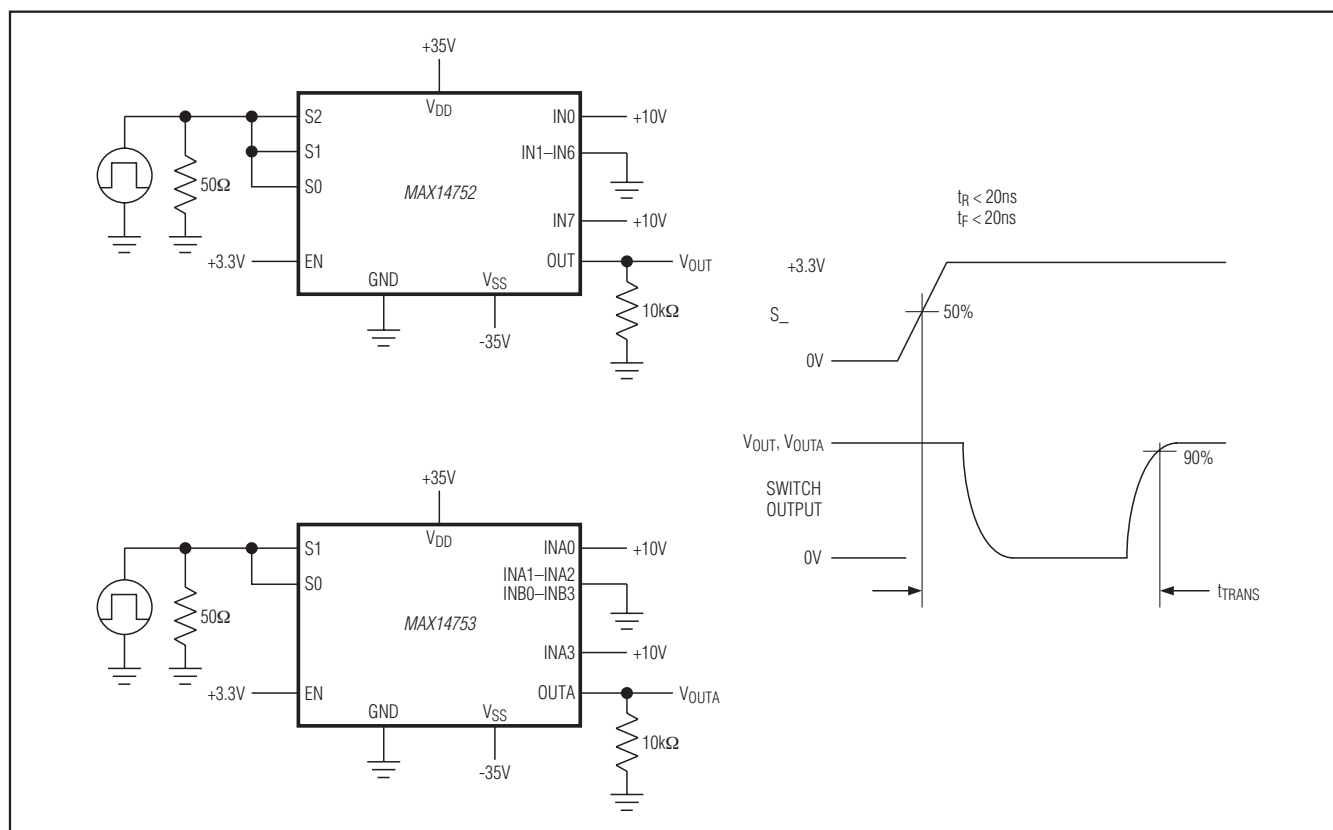


Figure 5. Transition Time

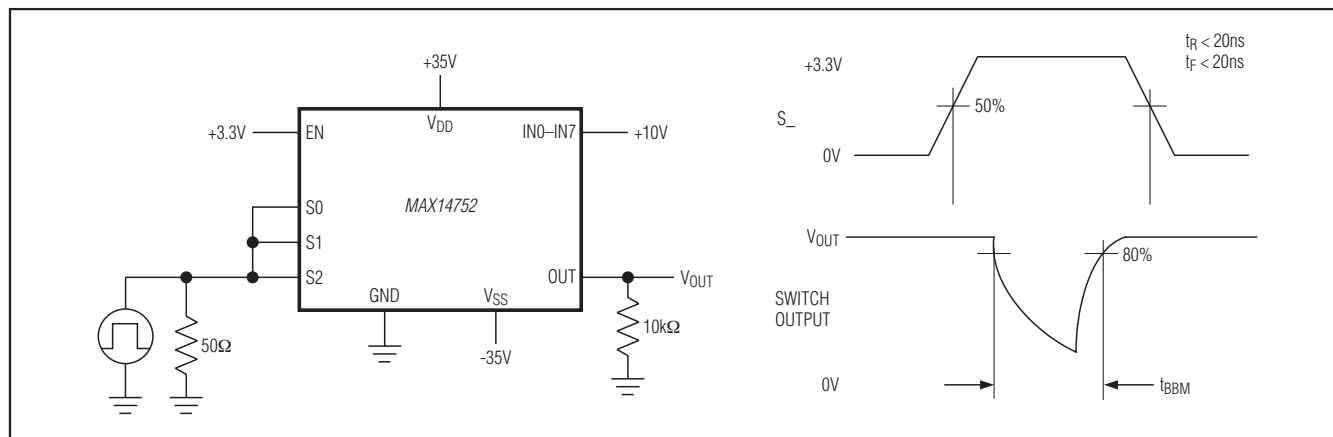


Figure 6. Break-Before-Make Interval

Test Circuits/Timing Diagrams/Truth Tables (continued)

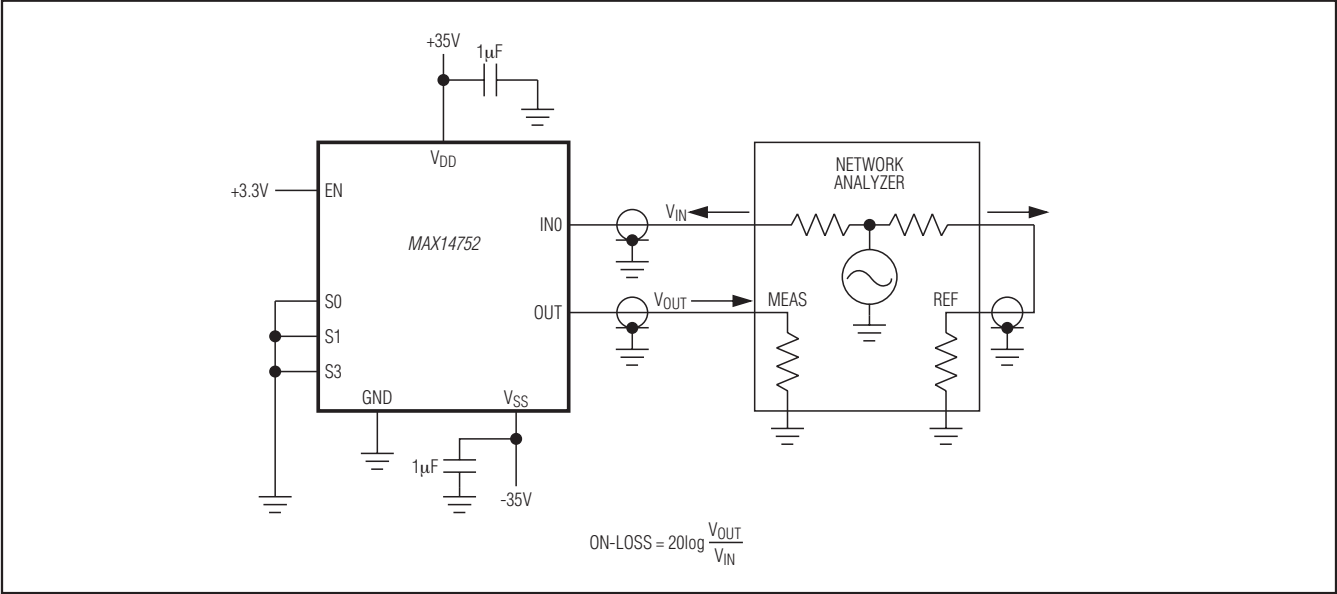


Figure 7. Frequency Response

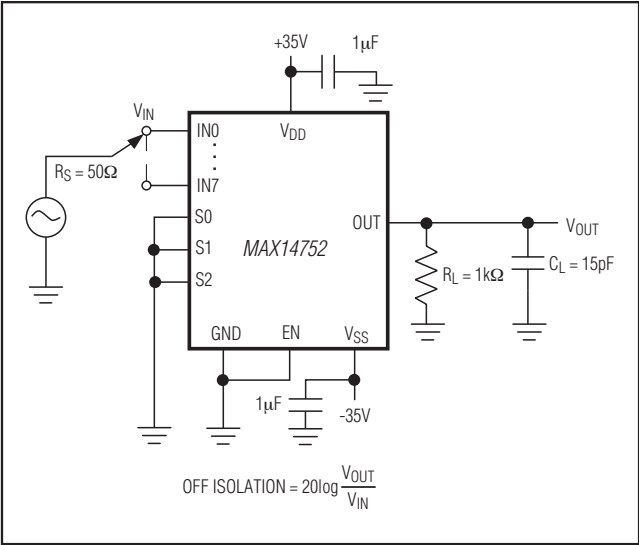


Figure 8. Off-Isolation

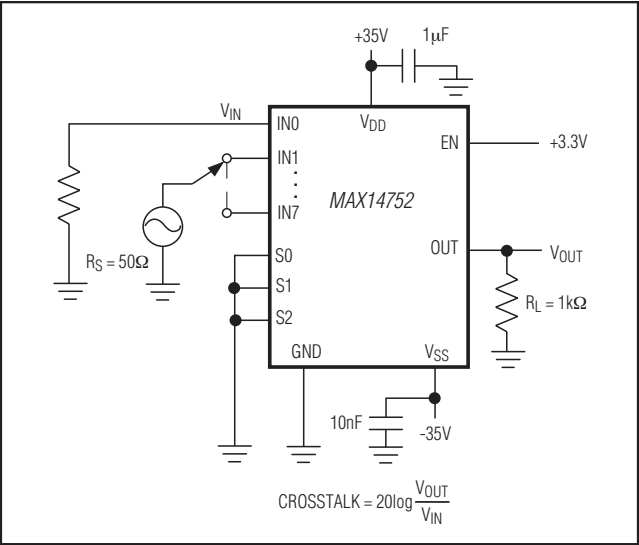


Figure 9. Crosstalk

Test Circuits/Timing Diagrams/Truth Tables (continued)

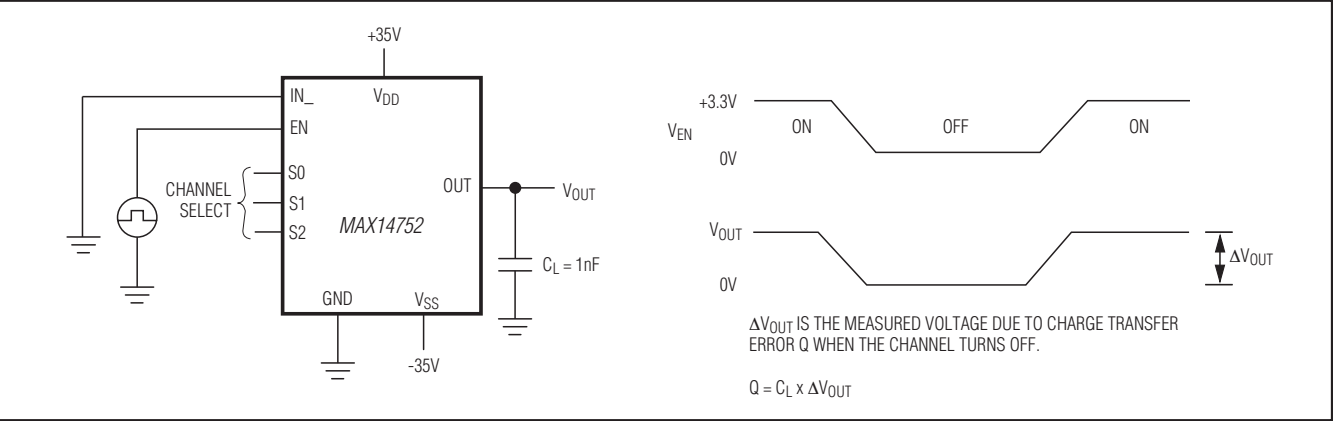


Table 1. MAX14752 Truth Table

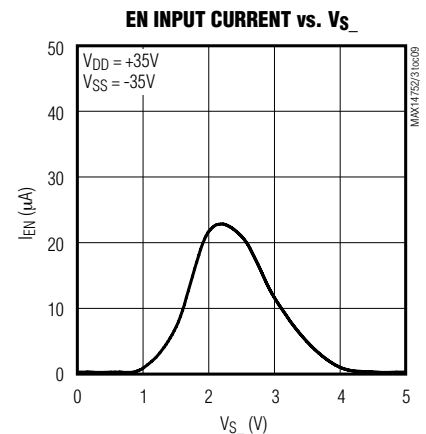
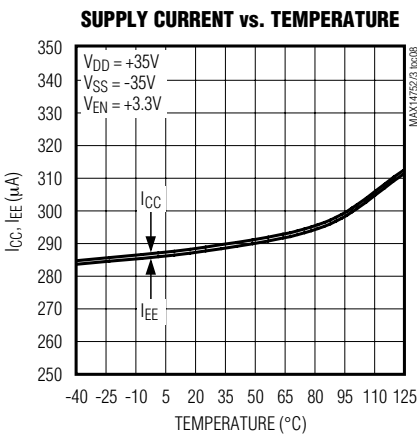
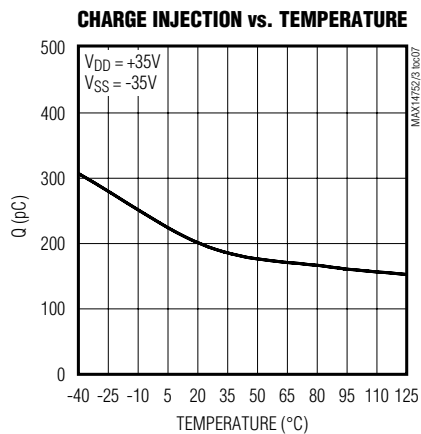
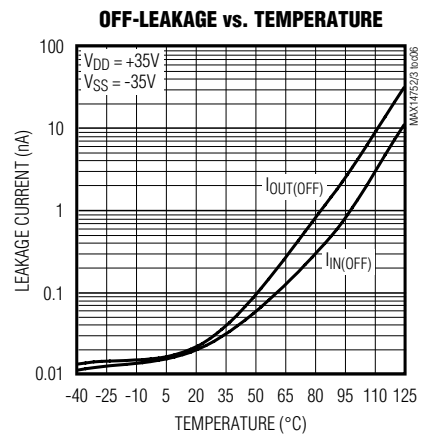
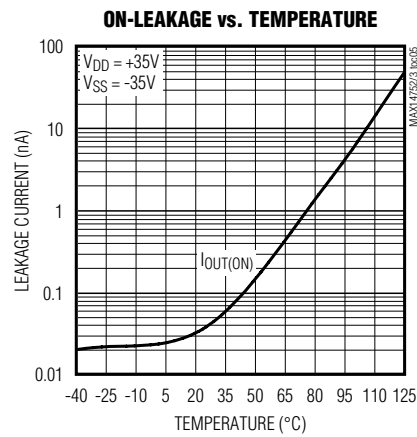
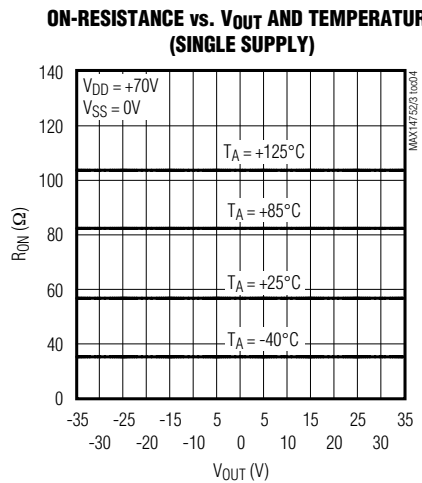
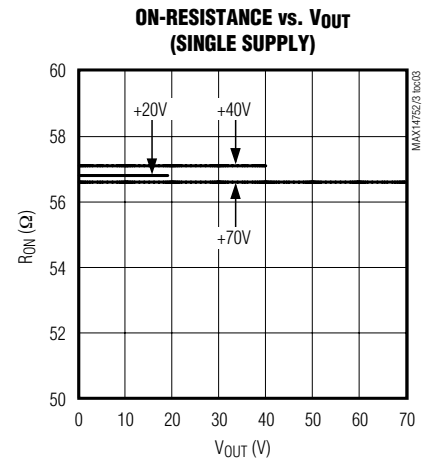
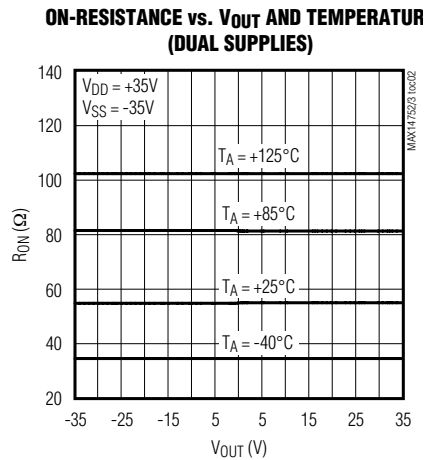
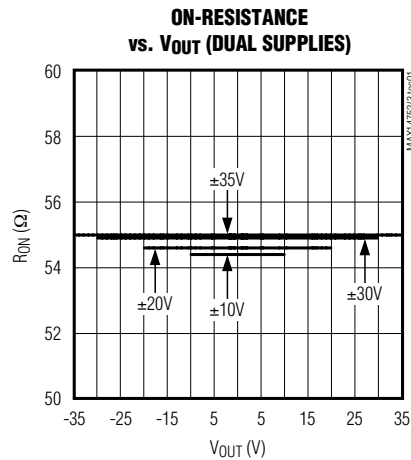
| S2 | S1 | S0 | EN | OUT     |
|----|----|----|----|---------|
| X  | X  | X  | 0  | All off |
| 0  | 0  | 0  | 1  | IN0     |
| 0  | 0  | 1  | 1  | IN1     |
| 0  | 1  | 0  | 1  | IN2     |
| 0  | 1  | 1  | 1  | IN3     |
| 1  | 0  | 0  | 1  | IN4     |
| 1  | 0  | 1  | 1  | IN5     |
| 1  | 1  | 0  | 1  | IN6     |
| 1  | 1  | 1  | 1  | IN7     |

Table 2. MAX14753 Truth Table

| S1 | S0 | EN | OUTA    | OUTB    |
|----|----|----|---------|---------|
| X  | X  | 0  | All off | All off |
| 0  | 0  | 1  | INA0    | INB0    |
| 0  | 1  | 1  | INA1    | INB1    |
| 1  | 0  | 1  | INA2    | INB2    |
| 1  | 1  | 1  | INA3    | INB3    |

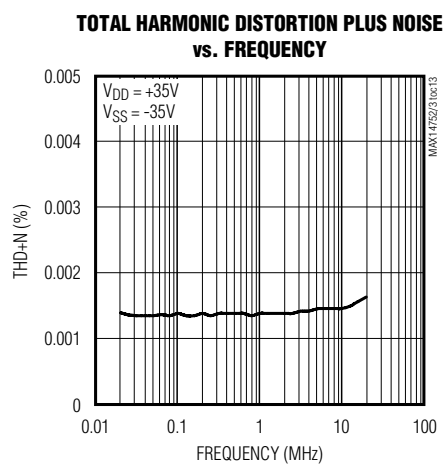
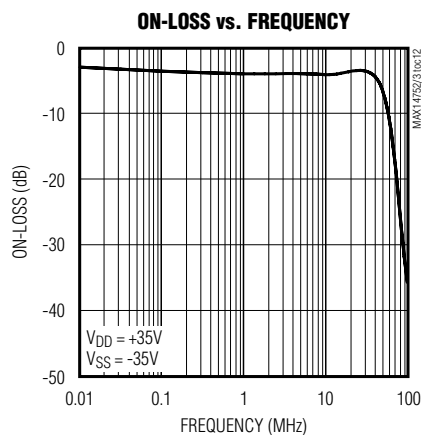
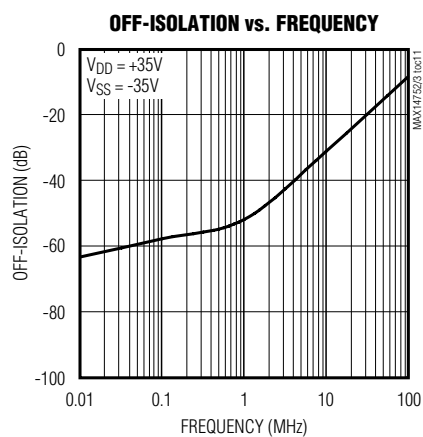
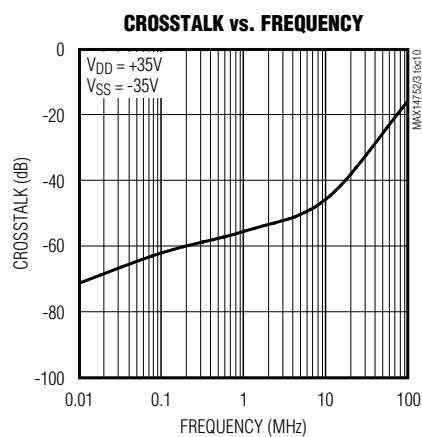
## Typical Operating Characteristics

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



## Typical Operating Characteristics (continued)

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



**MAX14752 Pin Description (Single 8-to-1 Mux)**

| PIN | NAME            | FUNCTION                                                                                                                              |
|-----|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1   | S0              | Mux Input Select                                                                                                                      |
| 2   | EN              | Mux Enable. Drive EN high to enable the device. The EN high voltage defines input logic voltage level for S0, S1, and S2.             |
| 3   | V <sub>SS</sub> | Negative Supply Voltage. Bypass V <sub>SS</sub> to GND with a 1μF ceramic capacitor.                                                  |
| 4   | IN0             | Bidirectional Analog Input                                                                                                            |
| 5   | IN1             | Bidirectional Analog Input                                                                                                            |
| 6   | IN2             | Bidirectional Analog Input                                                                                                            |
| 7   | IN3             | Bidirectional Analog Input                                                                                                            |
| 8   | OUT             | Bidirectional Analog Output                                                                                                           |
| 9   | IN7             | Bidirectional Analog Input                                                                                                            |
| 10  | IN6             | Bidirectional Analog Input                                                                                                            |
| 11  | IN5             | Bidirectional Analog Input                                                                                                            |
| 12  | IN4             | Bidirectional Analog Input                                                                                                            |
| 13  | V <sub>DD</sub> | Positive Supply Voltage. Bypass V <sub>DD</sub> to GND with a 1μF ceramic capacitor.                                                  |
| 14  | GND             | Ground. Connect GND to V <sub>SS</sub> for single supply. Bypass GND to V <sub>SS</sub> with a 1μF ceramic capacitor for dual supply. |
| 15  | S2              | Mux Input Select                                                                                                                      |
| 16  | S1              | Mux Input Select                                                                                                                      |

**MAX14753 Pin Description (Dual 4-to-1 Mux)**

| PIN | NAME            | FUNCTION                                                                                                                              |
|-----|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1   | S0              | Mux Input Select                                                                                                                      |
| 2   | EN              | Mux Enable. Drive EN high to enable the device. The EN high voltage defines input logic voltage level for S0 and S1.                  |
| 3   | V <sub>SS</sub> | Negative Supply Voltage. Bypass V <sub>SS</sub> to GND with a 1μF ceramic capacitor.                                                  |
| 4   | INA0            | Bidirectional Analog Input                                                                                                            |
| 5   | INA1            | Bidirectional Analog Input                                                                                                            |
| 6   | INA2            | Bidirectional Analog Input                                                                                                            |
| 7   | INA3            | Bidirectional Analog Input                                                                                                            |
| 8   | OUTA            | Bidirectional Analog Output                                                                                                           |
| 9   | OUTB            | Bidirectional Analog Output                                                                                                           |
| 10  | INB3            | Bidirectional Analog Input                                                                                                            |
| 11  | INB2            | Bidirectional Analog Input                                                                                                            |
| 12  | INB1            | Bidirectional Analog Input                                                                                                            |
| 13  | INB0            | Bidirectional Analog Input                                                                                                            |
| 14  | V <sub>DD</sub> | Positive Supply Voltage. Bypass V <sub>DD</sub> to GND with a 1μF ceramic capacitor.                                                  |
| 15  | GND             | Ground. Connect GND to V <sub>SS</sub> for single supply. Bypass GND to V <sub>SS</sub> with a 1μF ceramic capacitor for dual supply. |
| 16  | S1              | Mux Input Select                                                                                                                      |

## Detailed Description

The MAX14752/MAX14753 are 8-to-1 and dual 4-to-1 high-voltage analog multiplexers. Both devices feature 60Ω (typ) on-resistance with 0.03Ω (typ) on-resistance flatness. These low on-resistance multiplexers conduct equally well in either direction.

The MAX14752 is an 8-to-1 multiplexer and MAX14753 is a dual 4-to-1 multiplexer. Both devices operate with dual supplies of ±10V to ±36V or a single supply of +20V to +72V. Both devices can also operate with unbalanced supplies, such as +36V and -10V. These multiplexers support rail-to-rail input and output signals. The control logic level is defined via the EN input. These devices do not require power-supply sequencing.

## Applications Information

### Current Through the Mux

The current flowing through each on-channel of the MAX14752/MAX14753 multiplexers must be limited to ±5mA for normal operation. If the current exceeds this limit, an internal leakage current from that channel to V<sub>SS</sub> appears. Larger input current does not destroy the device if the max power dissipation is not exceeded.

### Input Voltage Clamping

For applications that require input voltages beyond the normal operating voltages, the internal input diodes to V<sub>DD</sub> and V<sub>SS</sub> can be used to limit the input voltages. As shown in Figure 11, series resistors can be employed at the inputs to limit the currents flowing into the diodes during undervoltage and overvoltage conditions. Choose the

limiting resistors such that the input currents are limited to I<sub>IN(max)</sub> = 100mA. The values of the current limit resistors can be calculated as the larger of R<sub>LIM+</sub> and R<sub>LIM-</sub>.

$$R_{LIM+} = \frac{V_{IN(max)} - V_{DD}}{I_{IN(max)}}$$

$$R_{LIM-} = \frac{V_{SS} - V_{IN(min)}}{I_{IN(max)}}$$

During an undervoltage or overvoltage condition, the input impedance is equal to R<sub>LIM</sub>. The additional power dissipation due to the fault currents needs to be calculated. The MAX14752/MAX14753 multiplexer operates normally on a channel that is on during an overvoltage or undervoltage clamping condition on a second channel that is not switched.

### Beyond-the-Rail Input

If input voltages are expected to go beyond the supply voltages, but within the absolute maximum supply voltages of the MAX14752/MAX14753, add two diodes in series with the supplies as shown in Figure 12.

During undervoltage and overvoltage events, the internal diodes pull V<sub>DD</sub>/V<sub>SS</sub> supplies up/down. An advantage of this scheme is that the input impedance is high and currents do not flow through the MAX14752/MAX14753 during overvoltage and undervoltage events. The input voltages must be limited to the voltages specified in the *Absolute Maximum Ratings* section.

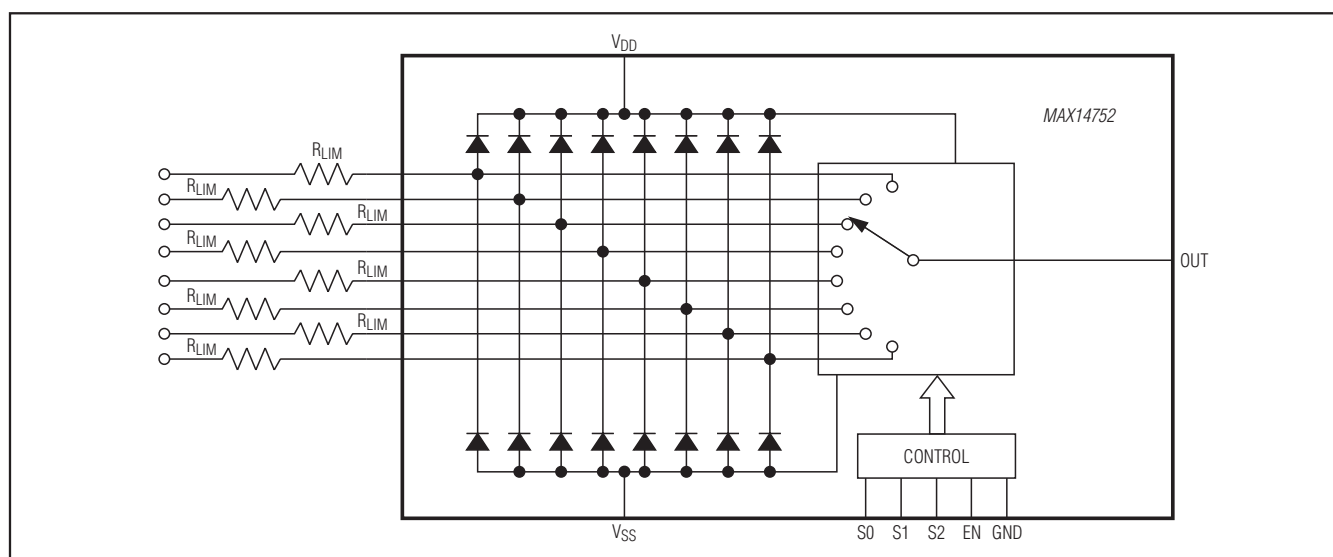


Figure 11. Input Overvoltage and Undervoltage Clamping

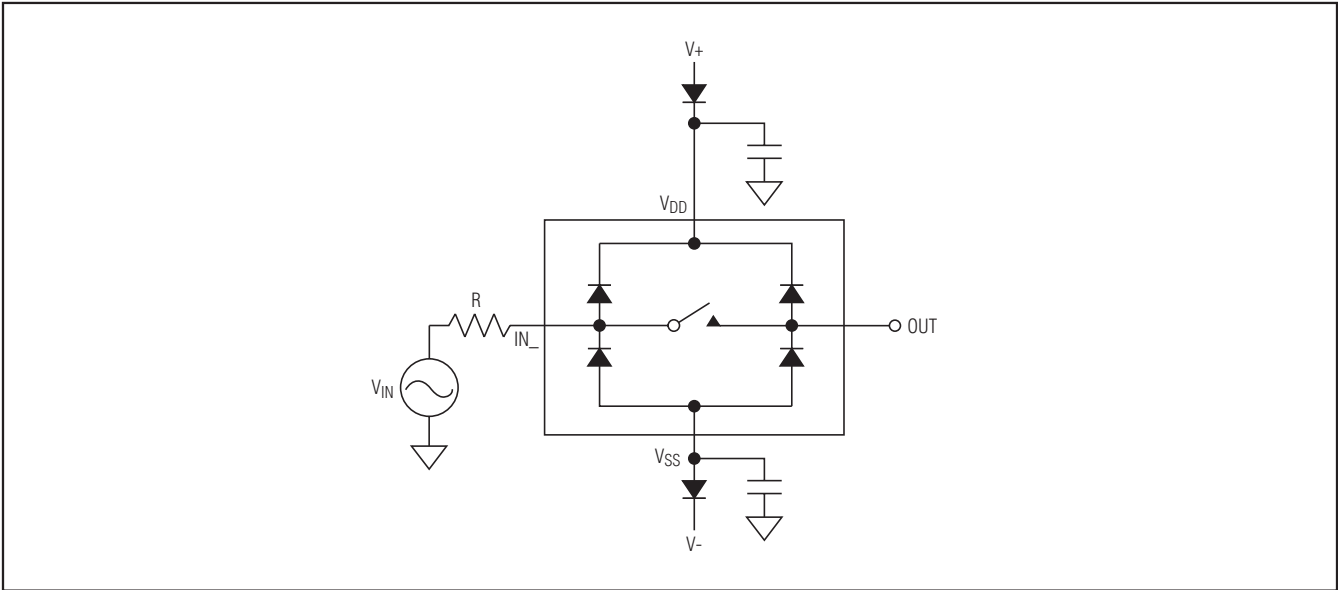
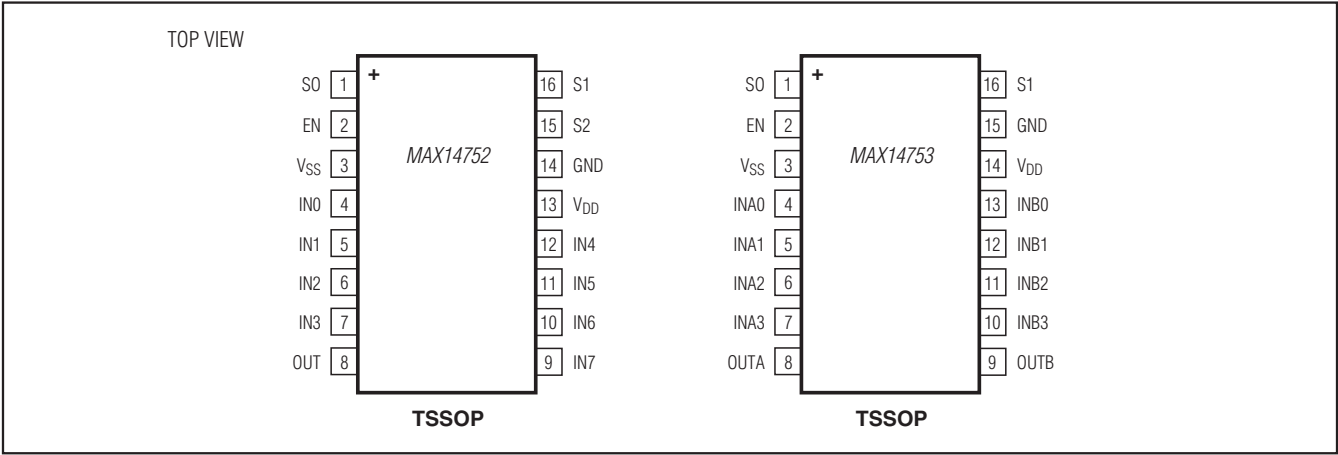


Figure 12. Beyond-the-Rail Application

Pin Configurations



Chip Information

PROCESS: CMOS

Package Information

For the latest package outline information and land patterns (footprints), go to [www.maximintegrated.com/packages](http://www.maximintegrated.com/packages). Note that a “+”, “#”, or “-” in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

| PACKAGE TYPE | PACKAGE CODE | OUTLINE NO.             | LAND PATTERN NO.        |
|--------------|--------------|-------------------------|-------------------------|
| 16 TSSOP     | U16+1        | <a href="#">21-0066</a> | <a href="#">90-0117</a> |

## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION                                                                                                                                   | PAGES CHANGED        |
|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 0               | 8/08          | Initial release                                                                                                                               | —                    |
| 1               | 10/08         | Changed the units from mA to $\mu$ A for $V_{DD}$ and $V_{SS}$ supply current in the <i>DC Electrical Characteristics—Dual Supplies</i> table | 2                    |
| 2               | 2/09          | Added capacitance information to EC table                                                                                                     | 2, 4, 13, 14, 15, 16 |
| 3               | 7/10          | Deleted the “Input Capacitance” parameter from the <i>DC Electrical Characteristics—Dual Supplies</i>                                         | 3                    |
| 4               | 4/15          | Removed automotive reference                                                                                                                  | 1                    |
| 5               | 5/15          | Revised <i>Benefits and Features</i> section                                                                                                  | 1                    |

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

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