

## 8-Channel, Dual 4-Channel, Triple 2-Channel Multiplexers

### DESCRIPTION

The DG9251, DG9252, and DG9253 are high precision single and dual supply CMOS analog multiplexers. DG9251 is an 8-channel multiplexer, the DG9252 is a dual 4-channel multiplexer, and the DG9253 is a triple 2-channel multiplexer or triple SPDT.

Designed to operate from a + 2.7 V to + 16 V single supply or from a  $\pm 2.7$  V to  $\pm 5$  V dual supplies, the DG9251, DG9252, and DG9253 are fully specified at + 16 V, + 5 V and  $\pm 5$  V. All control logic inputs have guaranteed 1.4 V high limit when operating from + 5 V or  $\pm 5$  V supplies and 1.65 V when operating from a + 16 V supply.

The DG9251, DG9252, and DG9253 are precision multiplexers of low leakage, low charge injection, and low parasitic capacitance. They conduct equally well in both directions, offer rail to rail analog signal handling and can be used both as multiplexers as well as de-multiplexers. The DG9251, DG9252, and DG9253 operating temperature is specified from - 40 °C to + 85 °C and are available in ultra compact 1.8 mm x 2.6 mm miniQFN16 packages.

### FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- + 2.7 V to + 16 V single supply operation
- $\pm 2.7$  V to  $\pm 5$  V dual supply operation
- Fully specified at + 16 V, + 5 V,  $\pm 5$  V
- Low charge injection (< 0.5 pC typ.)
- High bandwidth: 270 MHz
- Low switch capacitance ( $C_{s(off)}$  1 pF typ.)
- Good isolation and crosstalk performance (typ. - 44 dB at 100 MHz)
- MiniQFN16 package (1.8 mm x 2.6 mm)
- Compliant to RoHS Directive 2002/95/EC

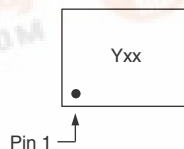
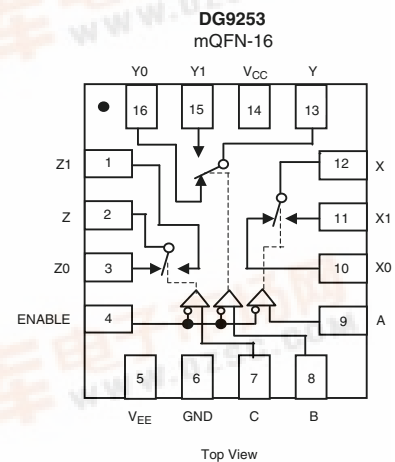
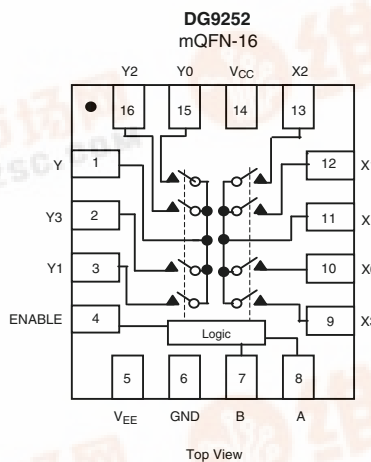
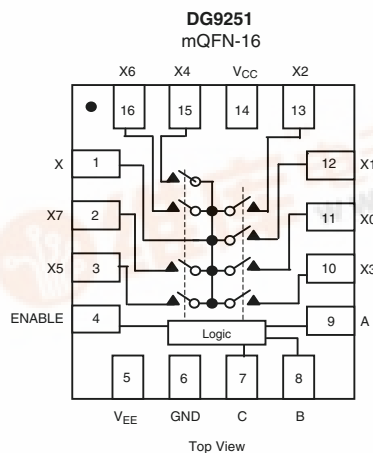


**RoHS**  
 COMPLIANT  
 HALOGEN  
 FREE

### APPLICATIONS

- Data acquisition
- Medical and healthcare devices
- Control and automation equipments
- Test instruments
- Touch panels
- Consumer

### FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



Device Marking: 8xx for DG9251  
 (miniQFN16) Hxx for DG9252  
 Jxx for DG9253

xx = Date/Lot Traceability Code

| TRUTH TABLE  |               |   |   |                   |                   |                           |
|--------------|---------------|---|---|-------------------|-------------------|---------------------------|
| Enable Input | Select Inputs |   |   | On Switches       |                   |                           |
|              | C             | B | A | DG9251            | DG9252            | DG9253                    |
| H            | X             | X | X | All Switches Open | All Switches Open | All Switches Open         |
| L            | L             | L | L | X to X0           | X to X0, Y to Y0  | X to X0, Y to Y0, Z to Z0 |
| L            | L             | L | H | X to X1           | X to X1, Y to Y1  | X to X1, Y to Y0, Z to Z0 |
| L            | L             | H | L | X to X2           | X to X2, Y to Y2  | X to X0, Y to Y1, Z to Z0 |
| L            | L             | H | H | X to X3           | X to X3, Y to Y3  | X to X1, Y to Y1, Z to Z0 |
| L            | H             | L | L | X to X4           | X to X0, Y to Y0  | X to X0, Y to Y0, Z to Z1 |
| L            | H             | L | H | X to X5           | X to X1, Y to Y1  | X to X1, Y to Y0, Z to Z1 |
| L            | H             | H | L | X to X6           | X to X2, Y to Y2  | X to X0, Y to Y1, Z to Z1 |
| L            | H             | H | H | X to X7           | X to X3, Y to Y3  | X to X1, Y to Y1, Z to Z1 |

| ORDERING INFORMATION           |                |                |
|--------------------------------|----------------|----------------|
| Temp. Range                    | Package        | Part Number    |
| DG9251, DG9252, DG9253         |                |                |
| - 40 °C to 125 °C <sup>a</sup> | 16-Pin miniQFN | DG9251EN-T1-E4 |
|                                |                | DG9252EN-T1-E4 |
|                                |                | DG9253EN-T1-E4 |

Notes:

a. - 40 °C to 85 °C datasheet limits apply.

| ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted) |                                |                                                                                        |      |
|---------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------|------|
| Parameter                                                                 |                                | Limit                                                                                  | Unit |
| V <sub>+</sub> to V <sub>-</sub>                                          |                                | 18                                                                                     | V    |
| GND to V <sub>-</sub>                                                     |                                | 9                                                                                      |      |
| Digital Inputs <sup>a</sup> , V <sub>S</sub> , V <sub>D</sub>             |                                | (V <sub>-</sub> ) - 0.3 to (V <sub>+</sub> ) + 0.3<br>or 30 mA, whichever occurs first |      |
| Continuous Current (Any terminal)                                         |                                | 30                                                                                     | mA   |
| Peak Current, S or D (Pulsed 1 ms, 10 % duty cycle)                       |                                | 100                                                                                    |      |
| Storage Temperature                                                       |                                | - 65 to 150                                                                            | °C   |
| Power Dissipation <sup>b</sup>                                            | 16-Pin miniQFN <sup>c, d</sup> | 525                                                                                    | mW   |
| Thermal Resistance <sup>b</sup>                                           | 16-Pin miniQFN <sup>d</sup>    | 152                                                                                    | °C/W |
| Latch-up (per JEDEC78)                                                    |                                | > 300                                                                                  | mA   |

Notes:

a. Signals on SX, DX, or INX exceeding V<sub>+</sub> or V<sub>-</sub> will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

b. All leads welded or soldered to PC board.

c. Derate 6.6 mW/°C above 70 °C.

d. Manual soldering with iron is not recommended for leadless components. The miniQFN-16 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper lip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.

| SPECIFICATIONS FOR DUAL SUPPLIES          |                       |                                                                                                                                                                      |             |                    |                   |                   |                   |                   |                   |      |
|-------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| Parameter                                 | Symbol                | Test Conditions<br>Unless Otherwise Specified<br>V <sub>CC</sub> = + 5 V, V <sub>EE</sub> = - 5 V<br>V <sub>IN(A, B, C and ENABLE)</sub> = 1.4 V, 0.3 V <sup>a</sup> |             | Temp. <sup>b</sup> | Typ. <sup>c</sup> | - 40 °C to 125 °C |                   | - 40 °C to 85 °C  |                   | Unit |
|                                           |                       |                                                                                                                                                                      |             |                    |                   | Min. <sup>d</sup> | Max. <sup>d</sup> | Min. <sup>d</sup> | Max. <sup>d</sup> |      |
| Analog Switch                             |                       |                                                                                                                                                                      |             |                    |                   |                   |                   |                   |                   |      |
| Analog Signal Range <sup>e</sup>          | V <sub>ANALOG</sub>   |                                                                                                                                                                      |             | Full               |                   | - 5               | 5                 | - 5               | 5                 | V    |
| On-Resistance                             | R <sub>ON</sub>       | I <sub>S</sub> = 1 mA, V <sub>D</sub> = - 3 V, 0 V, + 3 V                                                                                                            |             | Room Full          | 66                |                   | 100<br>125        |                   | 100<br>118        | Ω    |
| On-Resistance Match                       | ΔR <sub>ON</sub>      | I <sub>S</sub> = 1 mA, V <sub>D</sub> = ± 3 V                                                                                                                        |             | Room Full          | 3                 |                   | 6<br>10           |                   | 6<br>8            |      |
| On-Resistance Flatness                    | R <sub>FLATNESS</sub> | I <sub>S</sub> = 1 mA, V <sub>D</sub> = - 3 V, 0 V, + 3 V                                                                                                            |             | Room Full          | 10.2              |                   | 16<br>20          |                   | 16<br>18          |      |
| Switch Off Leakage Current                | I <sub>S(off)</sub>   | V <sub>+</sub> = 5.5 V, V <sub>-</sub> = - 5.5 V,<br>V <sub>D</sub> = ± 4.5 V, V <sub>S</sub> = ± 4.5 V                                                              |             | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            | nA   |
|                                           | I <sub>D(off)</sub>   |                                                                                                                                                                      |             | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            |      |
| Channel On Leakage Current                | I <sub>D(on)</sub>    | V <sub>+</sub> = 5.5 V, V <sub>-</sub> = - 5.5 V,<br>V <sub>S</sub> = V <sub>D</sub> = ± 4.5 V                                                                       |             | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            |      |
| Digital Control                           |                       |                                                                                                                                                                      |             |                    |                   |                   |                   |                   |                   |      |
| V <sub>IN(A, B, C and ENABLE)</sub> Low   | V <sub>IL</sub>       |                                                                                                                                                                      |             | Full               |                   |                   | 0.3               |                   | 0.3               | V    |
| V <sub>IN(A, B, C and ENABLE)</sub> High  | V <sub>IH</sub>       |                                                                                                                                                                      |             | Full               |                   | 1.4               |                   | 1.4               |                   |      |
| Input Current, V <sub>IN</sub> Low        | I <sub>IL</sub>       | V <sub>IN(A, B, C and ENABLE)</sub><br>under test = 0.3 V                                                                                                            |             | Full               | 0.01              | - 1               | 1                 | - 1               | 1                 | μA   |
| Input Current, V <sub>IN</sub> High       | I <sub>IH</sub>       | V <sub>IN(A, B, C and ENABLE)</sub><br>under test = 1.4 V                                                                                                            |             | Full               | 0.01              | - 1               | 1                 | - 1               | 1                 |      |
| Input Capacitance <sup>e</sup>            | C <sub>IN</sub>       | f = 1 MHz                                                                                                                                                            |             | Room               | 2.4               |                   |                   |                   |                   | pF   |
| Dynamic Characteristics                   |                       |                                                                                                                                                                      |             |                    |                   |                   |                   |                   |                   |      |
| Transition Time                           | t <sub>TRANS</sub>    | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>see figure 1, 2, 3                                                                                                 |             | Room Full          | 66                |                   | 180<br>218        |                   | 180<br>207        | ns   |
| Enable Turn-On Time                       | t <sub>ON</sub>       |                                                                                                                                                                      |             | Room Full          | 152               |                   | 250<br>295        |                   | 250<br>282        |      |
| Enable Turn-Off Time                      | t <sub>OFF</sub>      |                                                                                                                                                                      |             | Room Full          | 60                |                   | 125<br>136        |                   | 125<br>131        |      |
| Break-Before-Make Time Delay              | t <sub>D</sub>        |                                                                                                                                                                      |             | Room Full          | 32                |                   | 13                |                   | 13                |      |
| Off Isolation <sup>e</sup>                | OIRR                  | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 15 pF                                                                                                                        | f = 100 kHz | Room               | < - 90            |                   |                   |                   |                   | dB   |
|                                           |                       |                                                                                                                                                                      | f = 10 MHz  | Room               | - 63              |                   |                   |                   |                   |      |
| f = 100 MHz                               | Room                  |                                                                                                                                                                      | - 42        |                    |                   |                   |                   |                   |                   |      |
| Channel-to-Channel Crosstalk <sup>e</sup> | X <sub>TALK</sub>     |                                                                                                                                                                      | f = 100 kHz | Room               | < - 90            |                   |                   |                   |                   |      |
|                                           |                       |                                                                                                                                                                      | f = 10 MHz  | Room               | - 67              |                   |                   |                   |                   |      |
|                                           |                       |                                                                                                                                                                      | f = 100 MHz | Room               | - 45              |                   |                   |                   |                   |      |
| Bandwidth, 3 dB                           | BW                    | R <sub>L</sub> = 50 Ω                                                                                                                                                | DG9251      | Room               | 270               |                   |                   |                   | MHz               |      |
|                                           |                       |                                                                                                                                                                      | DG9253      | Room               | 525               |                   |                   |                   |                   |      |
| Charge Injection <sup>e</sup>             | Q                     | V <sub>g</sub> = 0 V, R <sub>g</sub> = 0 Ω, C <sub>L</sub> = 1 nF                                                                                                    |             | Room               | 0.5               |                   |                   |                   |                   | pC   |
| Source Off Capacitance <sup>e</sup>       | C <sub>S(off)</sub>   | f = 1 MHz                                                                                                                                                            | DG9251      | Room               | 1                 |                   |                   |                   |                   | pF   |
|                                           |                       |                                                                                                                                                                      | DG9253      | Room               | 1                 |                   |                   |                   |                   |      |
| Drain Off Capacitance <sup>e</sup>        | C <sub>D(off)</sub>   | f = 1 MHz                                                                                                                                                            | DG9251      | Room               | 10                |                   |                   |                   |                   |      |
|                                           |                       |                                                                                                                                                                      | DG9253      | Room               | 3                 |                   |                   |                   |                   |      |
| Channel On Capacitance <sup>e</sup>       | C <sub>D(on)</sub>    | f = 1 MHz                                                                                                                                                            | DG9251      | Room               | 16                |                   |                   |                   |                   |      |
|                                           |                       |                                                                                                                                                                      | DG9253      | Room               | 8                 |                   |                   |                   |                   |      |
| Total Harmonic Distortion <sup>e</sup>    | THD                   | Signal = 1 V <sub>RMS</sub> ,<br>20 Hz to 20 kHz, R <sub>L</sub> = 600 Ω                                                                                             |             | Room               | 0.01              |                   |                   |                   |                   | %    |

## SPECIFICATIONS FOR DUAL SUPPLIES

| Parameter               | Symbol           | Test Conditions<br>Unless Otherwise Specified<br>V <sub>CC</sub> = + 5 V, V <sub>EE</sub> = - 5 V<br>V <sub>IN(A, B, C and ENABLE)</sub> = 1.4 V, 0.3 V <sup>a</sup> | Temp. <sup>b</sup> | Typ. <sup>c</sup> | - 40 °C to 125 °C |                   | - 40 °C to 85 °C  |                   | Unit |
|-------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
|                         |                  |                                                                                                                                                                      |                    |                   | Min. <sup>d</sup> | Max. <sup>d</sup> | Min. <sup>d</sup> | Max. <sup>d</sup> |      |
| Power Supplies          |                  |                                                                                                                                                                      |                    |                   |                   |                   |                   |                   |      |
| Power Supply Current    | I+               | V <sub>CC</sub> = + 5 V, V <sub>EE</sub> = - 5 V<br>V <sub>IN(A, B, C and ENABLE)</sub> = 0 or 5 V                                                                   | Room Full          | 0.05              |                   | 1<br>10           |                   | 1<br>10           | μA   |
| Negative Supply Current | I-               |                                                                                                                                                                      | Room Full          | - 0.05            | - 1<br>- 10       |                   | - 1<br>- 10       |                   |      |
| Ground Current          | I <sub>GND</sub> |                                                                                                                                                                      | Room Full          | - 0.05            | - 1<br>- 10       |                   | - 1<br>- 10       |                   |      |

## SPECIFICATIONS FOR UNIPOLAR SUPPLIES

| Parameter                                 | Symbol                | Test Conditions<br>Unless Otherwise Specified<br>V <sub>CC</sub> = + 5 V, V <sub>EE</sub> = 0 V<br>V <sub>IN(A, B, C and ENABLE)</sub> = 1.4 V, 0.3 V <sup>a</sup> | Temp. <sup>b</sup> | Typ. <sup>c</sup> | - 40 °C to 125 °C |                   | - 40 °C to 85 °C  |                   | Unit |
|-------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
|                                           |                       |                                                                                                                                                                    |                    |                   | Min. <sup>d</sup> | Max. <sup>d</sup> | Min. <sup>d</sup> | Max. <sup>d</sup> |      |
| Analog Switch                             |                       |                                                                                                                                                                    |                    |                   |                   |                   |                   |                   |      |
| Analog Signal Range <sup>e</sup>          | V <sub>ANALOG</sub>   |                                                                                                                                                                    | Full               |                   | 0                 | 5                 | 0                 | 5                 | V    |
| On-Resistance                             | R <sub>ON</sub>       | I <sub>S</sub> = 1 mA, V <sub>D</sub> = 0 V, + 3.5 V                                                                                                               | Room Full          | 105               |                   | 165<br>205        |                   | 165<br>194        | Ω    |
| On-Resistance Match                       | ΔR <sub>ON</sub>      | I <sub>S</sub> = 1 mA, V <sub>D</sub> = + 3.5 V                                                                                                                    | Room Full          | 3.2               |                   | 8<br>13           |                   | 8<br>10           |      |
| On-Resistance Flatness                    | R <sub>FLATNESS</sub> | I <sub>S</sub> = 1 mA, V <sub>D</sub> = 0 V, + 3 V                                                                                                                 | Room Full          | 17                |                   | 26<br>30          |                   | 26<br>28          |      |
| Switch Off Leakage Current                | I <sub>S(off)</sub>   | V <sub>+</sub> = + 5.5 V, V <sub>-</sub> = 0 V<br>V <sub>D</sub> = 1 V/4.5 V, V <sub>S</sub> = 4.5 V/1 V                                                           | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            | nA   |
|                                           | I <sub>D(off)</sub>   |                                                                                                                                                                    | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            |      |
| Channel On Leakage Current                | I <sub>D(on)</sub>    | V <sub>+</sub> = + 5.5 V, V <sub>-</sub> = 0 V<br>V <sub>D</sub> = V <sub>S</sub> = 1 V/4.5 V                                                                      | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            |      |
| Digital Control                           |                       |                                                                                                                                                                    |                    |                   |                   |                   |                   |                   |      |
| V <sub>IN(A, B, C and ENABLE)</sub> Low   | V <sub>IL</sub>       |                                                                                                                                                                    | Full               |                   |                   | 0.3               |                   | 0.3               | V    |
| V <sub>IN(A, B, C and ENABLE)</sub> High  | V <sub>IH</sub>       |                                                                                                                                                                    | Full               |                   | 1.4               |                   | 1.4               |                   |      |
| Input Current, V <sub>IN</sub> Low        | I <sub>L</sub>        | V <sub>IN(A, B, C and ENABLE)</sub><br>under test = 0.3 V                                                                                                          | Full               | 0.01              | - 1               | 1                 | - 1               | 1                 | μA   |
| Input Current, V <sub>IN</sub> High       | I <sub>H</sub>        | V <sub>IN(A, B, C and ENABLE)</sub><br>under test = 1.4 V                                                                                                          | Full               | 0.01              | - 1               | 1                 | - 1               | 1                 |      |
| Dynamic Characteristics                   |                       |                                                                                                                                                                    |                    |                   |                   |                   |                   |                   |      |
| Transition Time                           | t <sub>TRANS</sub>    | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>See Figure 1, 2, 3                                                                                               | Room Full          | 79                |                   | 205<br>295        |                   | 205<br>285        | ns   |
| Enable Turn-On Time                       | t <sub>ON</sub>       |                                                                                                                                                                    | Room Full          | 220               |                   | 335<br>403        |                   | 335<br>393        |      |
| Enable Turn-Off Time                      | t <sub>OFF</sub>      |                                                                                                                                                                    | Room Full          | 93                |                   | 150<br>173        |                   | 150<br>163        |      |
| Break-Before-Make Time Delay              | t <sub>D</sub>        |                                                                                                                                                                    | Room Full          | 36                |                   | 20                |                   | 20                |      |
| Charge Injection <sup>e</sup>             | Q                     | V <sub>g</sub> = 0 V, R <sub>g</sub> = 0 Ω, C <sub>L</sub> = 1 nF                                                                                                  | Full               | 0.44              |                   |                   |                   |                   | pC   |
| Off Isolation <sup>e</sup>                | OIRR                  | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 15 pF<br>f = 100 kHz                                                                                                       | Room               | < - 90            |                   |                   |                   |                   | dB   |
| Channel-to-Channel Crosstalk <sup>e</sup> | X <sub>TALK</sub>     |                                                                                                                                                                    | Room               | < - 90            |                   |                   |                   |                   |      |

**SPECIFICATIONS FOR UNIPOLAR SUPPLIES**

| Parameter                           | Symbol              | Test Conditions<br>Unless Otherwise Specified<br>V <sub>CC</sub> = + 5 V, V <sub>EE</sub> = 0 V<br>V <sub>IN</sub> (A, B, C and ENABLE) = 1.4 V, 0.3 V <sup>a</sup> |        | Temp. <sup>b</sup> | Typ. <sup>c</sup> | - 40 °C to 125 °C |                   | - 40 °C to 85 °C  |                   | Unit |
|-------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
|                                     |                     |                                                                                                                                                                     |        |                    |                   | Min. <sup>d</sup> | Max. <sup>d</sup> | Min. <sup>d</sup> | Max. <sup>d</sup> |      |
| Dynamic Characteristics             |                     |                                                                                                                                                                     |        |                    |                   |                   |                   |                   |                   |      |
| Source Off Capacitance <sup>e</sup> | C <sub>S(off)</sub> | f = 1 MHz                                                                                                                                                           | DG9251 | Room               | 2                 |                   |                   |                   |                   | pF   |
|                                     |                     |                                                                                                                                                                     | DG9253 | Room               | 1                 |                   |                   |                   |                   |      |
| Drain Off Capacitance <sup>e</sup>  | C <sub>D(off)</sub> | f = 1 MHz                                                                                                                                                           | DG9251 | Room               | 13                |                   |                   |                   |                   |      |
|                                     |                     |                                                                                                                                                                     | DG9253 | Room               | 3                 |                   |                   |                   |                   |      |
| Channel On Capacitance <sup>e</sup> | C <sub>D(on)</sub>  | f = 1 MHz                                                                                                                                                           | DG9251 | Room               | 17                |                   |                   |                   |                   |      |
|                                     |                     |                                                                                                                                                                     | DG9253 | Room               | 9                 |                   |                   |                   |                   |      |
| Power Supplies                      |                     |                                                                                                                                                                     |        |                    |                   |                   |                   |                   |                   |      |
| Power Supply Current                | I+                  | V <sub>IN</sub> (A, B, C and ENABLE) = 0 V or 5 V                                                                                                                   |        | Room Full          | 0.05              |                   | 1<br>10           |                   | 1<br>10           | μA   |
| Negative Supply Current             | I-                  |                                                                                                                                                                     |        | Room Full          | - 0.05            | - 1<br>- 10       |                   | - 1<br>- 10       |                   |      |
| Ground Current                      | I <sub>GND</sub>    |                                                                                                                                                                     |        | Room Full          | - 0.05            | - 1<br>- 10       |                   | - 1<br>- 10       |                   |      |

**SPECIFICATIONS FOR UNIPOLAR SUPPLIES**

| Parameter                                 | Symbol                | Test Conditions<br>Unless Otherwise Specified<br>V <sub>CC</sub> = + 16 V, V <sub>EE</sub> = 0 V<br>V <sub>IN</sub> (A, B, C and ENABLE) = 1.6 V, 0.5 V <sup>a</sup> | Temp. <sup>b</sup> | Typ. <sup>c</sup> | - 40 °C to 125 °C |                   | - 40 °C to 85 °C  |                   | Unit |  |
|-------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|--|
|                                           |                       |                                                                                                                                                                      |                    |                   | Min. <sup>d</sup> | Max. <sup>d</sup> | Min. <sup>d</sup> | Max. <sup>d</sup> |      |  |
| Analog Switch                             |                       |                                                                                                                                                                      |                    |                   |                   |                   |                   |                   |      |  |
| Analog Signal Range <sup>e</sup>          | V <sub>ANALOG</sub>   |                                                                                                                                                                      | Full               |                   | 0                 | 12                | 0                 | 12                | V    |  |
| On-Resistance                             | R <sub>ON</sub>       | I <sub>S</sub> = 1 mA, V <sub>D</sub> = 0.7 V, 8.0 V, 15.3 V                                                                                                         | Room Full          | 75                |                   | 105<br>133        |                   | 105<br>127        | Ω    |  |
| On-Resistance Match                       | ΔR <sub>ON</sub>      | I <sub>S</sub> = 1 mA, V <sub>D</sub> = + 0.7 V                                                                                                                      | Room Full          | 3                 |                   | 7<br>10           |                   | 7<br>8            |      |  |
| On-Resistance Flatness                    | R <sub>FLATNESS</sub> | I <sub>S</sub> = 1 mA, V <sub>D</sub> = 0.7 V, + 15.3 V                                                                                                              | Room Full          | 32                |                   | 45<br>49          |                   | 45<br>47          |      |  |
| Switch Off Leakage Current                | I <sub>S(off)</sub>   | V <sub>+</sub> = + 16 V, V <sub>-</sub> = 0 V<br>V <sub>D</sub> = 1 V/15 V, V <sub>S</sub> = 15 V/1 V                                                                | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            | nA   |  |
|                                           | I <sub>D(off)</sub>   |                                                                                                                                                                      | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            |      |  |
| Channel On Leakage Current                | I <sub>D(on)</sub>    | V <sub>+</sub> = + 16 V, V <sub>-</sub> = 0 V<br>V <sub>D</sub> = V <sub>S</sub> = 1 V/15 V                                                                          | Room Full          | ± 0.02            | - 1<br>- 50       | 1<br>50           | - 1<br>- 5        | 1<br>5            |      |  |
| Digital Control                           |                       |                                                                                                                                                                      |                    |                   |                   |                   |                   |                   |      |  |
| V <sub>IN</sub> (A, B, C and ENABLE) Low  | V <sub>IL</sub>       |                                                                                                                                                                      | Full               |                   |                   | 0.5               |                   | 0.5               | V    |  |
| V <sub>IN</sub> (A, B, C and ENABLE) High | V <sub>IH</sub>       |                                                                                                                                                                      | Full               |                   | 1.6               |                   | 1.6               |                   |      |  |
| Input Current, V <sub>IN</sub> Low        | I <sub>L</sub>        | V <sub>IN</sub> (A, B, C and ENABLE)<br>under test = 0.5 V                                                                                                           | Full               | 0.01              | - 1               | 1                 | - 1               | 1                 | μA   |  |
| Input Current, V <sub>IN</sub> High       | I <sub>H</sub>        | V <sub>IN</sub> (A, B, C and ENABLE)<br>under test = 1.6 V                                                                                                           | Full               | 0.01              | - 1               | 1                 | - 1               | 1                 |      |  |
| Dynamic Characteristics                   |                       |                                                                                                                                                                      |                    |                   |                   |                   |                   |                   |      |  |
| Transition Time                           | t <sub>TRANS</sub>    | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>see figure 1, 2, 3                                                                                                 | Room Full          | 55                |                   | 130<br>160        |                   | 130<br>150        | ns   |  |
| Enable Turn-On Time                       | t <sub>ON</sub>       |                                                                                                                                                                      | Room Full          | 95                |                   | 175<br>210        |                   | 175<br>195        |      |  |
| Enable Turn-Off Time                      | t <sub>OFF</sub>      |                                                                                                                                                                      | Room Full          | 33                |                   | 120<br>134        |                   | 120<br>127        |      |  |
| Break-Before-Make Time Delay              | t <sub>D</sub>        |                                                                                                                                                                      | Room Full          | 27                |                   | 12                |                   | 12                |      |  |
| Charge Injection <sup>e</sup>             | Q                     | V <sub>g</sub> = 0 V, R <sub>g</sub> = 0 Ω, C <sub>L</sub> = 1 nF                                                                                                    | Room               | 0.18              |                   |                   |                   |                   | pC   |  |

## SPECIFICATIONS FOR UNIPOLAR SUPPLIES

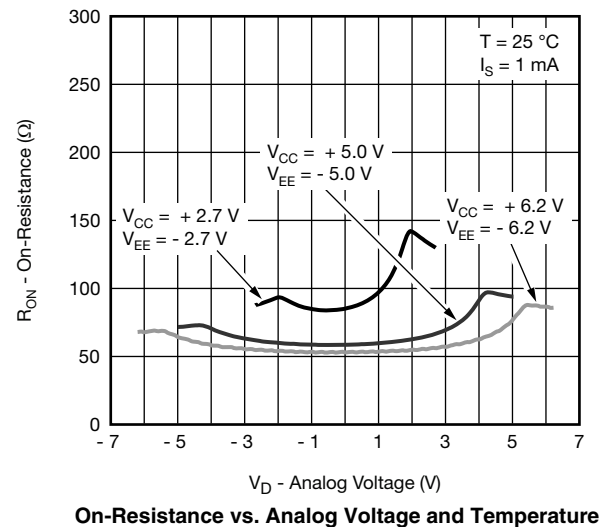
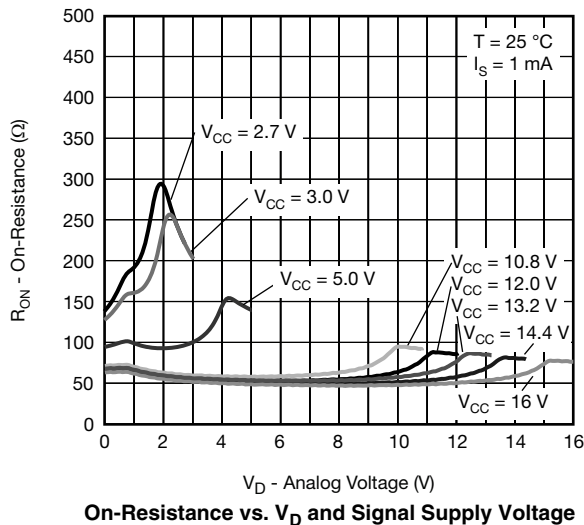
| Parameter                                 | Symbol              | Test Conditions<br>Unless Otherwise Specified<br>V <sub>CC</sub> = + 16 V, V <sub>EE</sub> = 0 V<br>V <sub>IN(A, B, C and ENABLE)</sub> = 1.6 V, 0.5 V <sup>a</sup> |                   | Temp. <sup>b</sup> | Typ. <sup>c</sup> | - 40 °C to 125 °C |                   | - 40 °C to 85 °C |         | Unit |
|-------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------|-------------------|-------------------|-------------------|------------------|---------|------|
|                                           |                     | Min. <sup>d</sup>                                                                                                                                                   | Max. <sup>d</sup> |                    |                   | Min. <sup>d</sup> | Max. <sup>d</sup> |                  |         |      |
| Dynamic Characteristics                   |                     |                                                                                                                                                                     |                   |                    |                   |                   |                   |                  |         |      |
| Off Isolation <sup>e</sup>                | OIRR                | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 15 pF<br>f = 100 kHz                                                                                                        |                   | Room               | < - 90            |                   |                   |                  |         | dB   |
| Channel-to-Channel Crosstalk <sup>e</sup> | X <sub>TALK</sub>   |                                                                                                                                                                     |                   | Room               | < - 90            |                   |                   |                  |         |      |
| Source Off Capacitance <sup>e</sup>       | C <sub>S(off)</sub> | f = 1 MHz                                                                                                                                                           | DG9251            | Room               | 2                 |                   |                   |                  |         | pF   |
|                                           |                     |                                                                                                                                                                     | DG9253            | Room               | 1                 |                   |                   |                  |         |      |
| Drain Off Capacitance <sup>e</sup>        | C <sub>D(off)</sub> | f = 1 MHz                                                                                                                                                           | DG9251            | Room               | 13                |                   |                   |                  |         |      |
|                                           |                     |                                                                                                                                                                     | DG9253            | Room               | 3                 |                   |                   |                  |         |      |
| Channel On Capacitance <sup>e</sup>       | C <sub>D(on)</sub>  | f = 1 MHz                                                                                                                                                           | DG9251            | Room               | 16                |                   |                   |                  |         |      |
|                                           |                     |                                                                                                                                                                     | DG9253            | Room               | 8                 |                   |                   |                  |         |      |
| Power Supplies                            |                     |                                                                                                                                                                     |                   |                    |                   |                   |                   |                  |         |      |
| Power Supply Current                      | I <sub>+</sub>      | V <sub>IN(A, B, C and ENABLE)</sub> = 0 V or 16 V                                                                                                                   |                   | Room Full          | 0.05              |                   | 1<br>10           |                  | 1<br>10 | μA   |
| Negative Supply Current                   | I <sub>-</sub>      |                                                                                                                                                                     |                   | Room Full          | - 0.05            | - 1<br>- 10       |                   | - 1<br>- 10      |         |      |
| Ground Current                            | I <sub>GND</sub>    |                                                                                                                                                                     |                   | Room Full          | - 0.05            | - 1<br>- 10       |                   | - 1<br>- 10      |         |      |

## Notes:

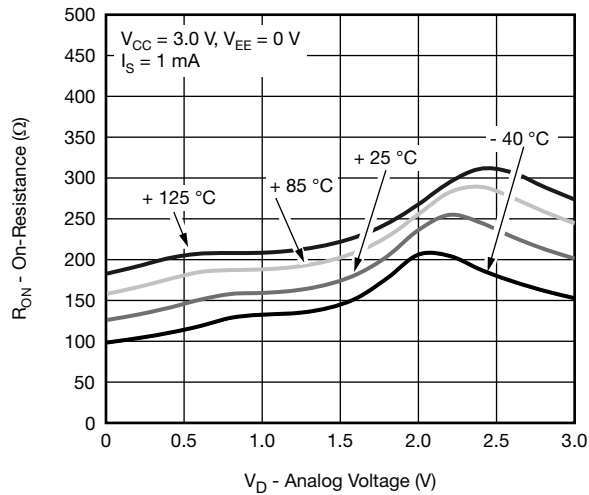
- a.  $V_{IN}$  = input voltage to perform proper function.  
b. Room - 25 °C, Full = as determined by the operating temperature suffix.  
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.  
d. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.  
e. Guaranteed by design, not subject to production test.

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.

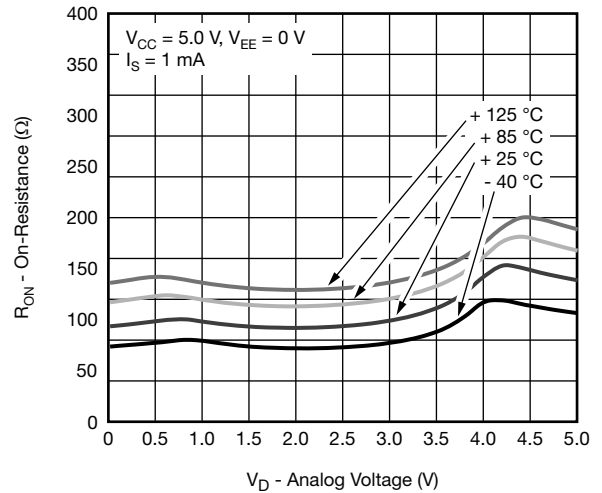
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



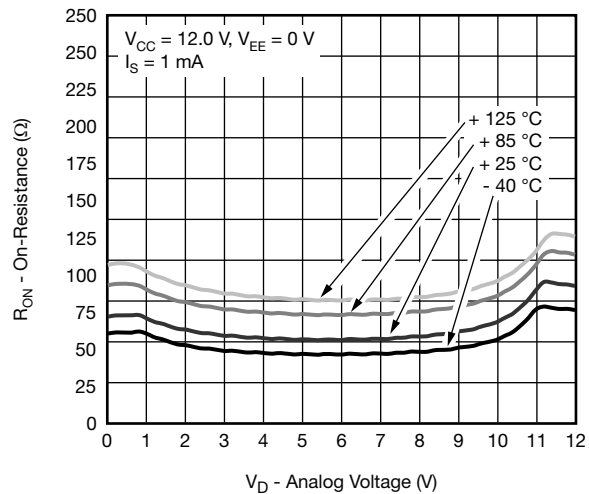
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



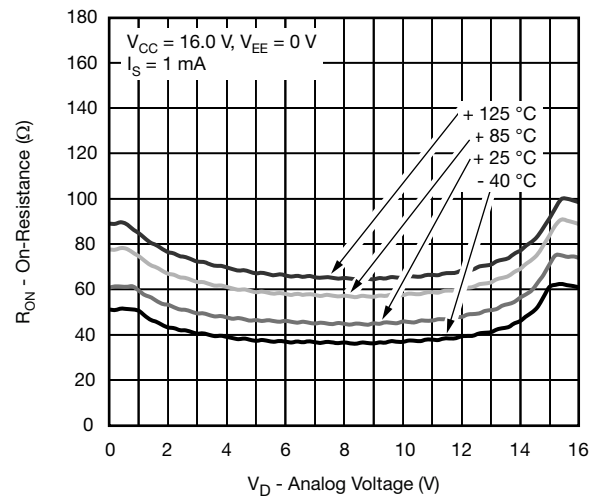
**On-Resistance vs. Analog Voltage and Temperature**



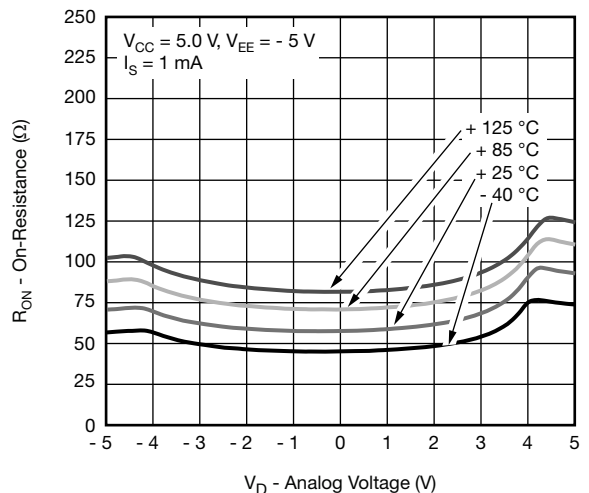
**On-Resistance vs. Analog Voltage and Temperature**



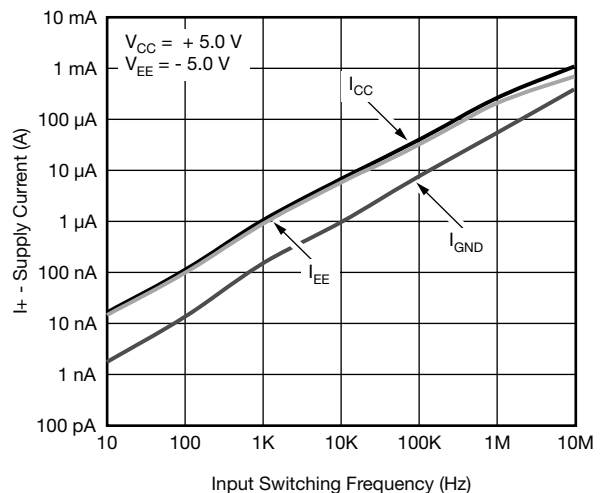
**On-Resistance vs. Analog Voltage and Temperature**



**On-Resistance vs. Analog Voltage and Temperature**

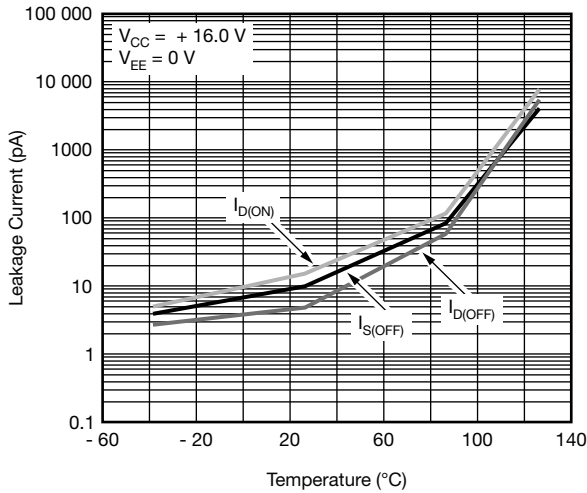


**On-Resistance vs. Analog Voltage and Temperature**

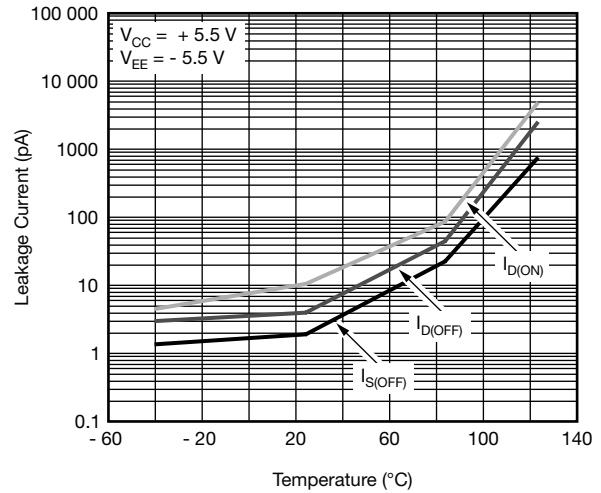


**Supply Current vs. Input Switching Frequency**

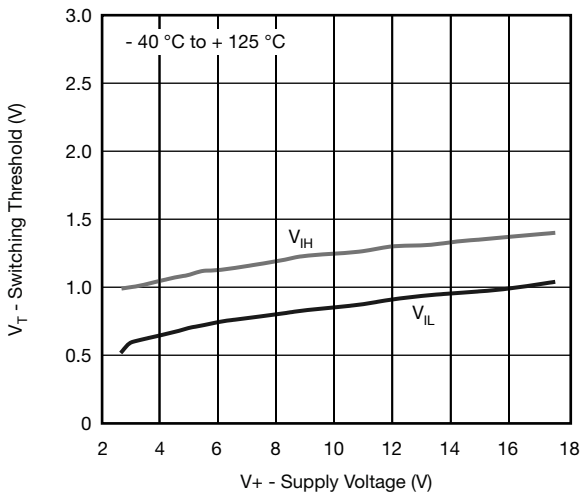
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



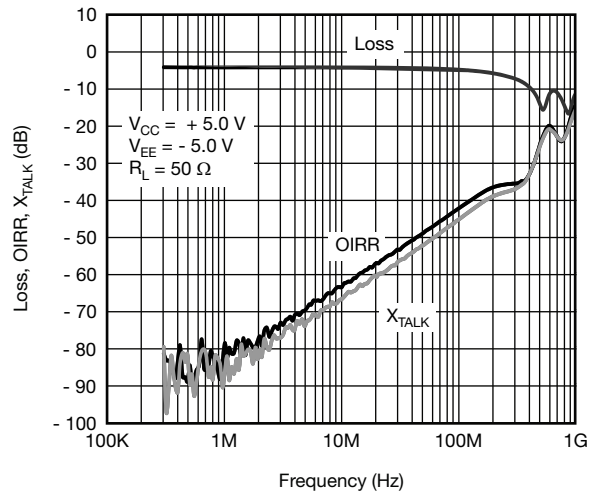
Leakage Current vs. Temperature



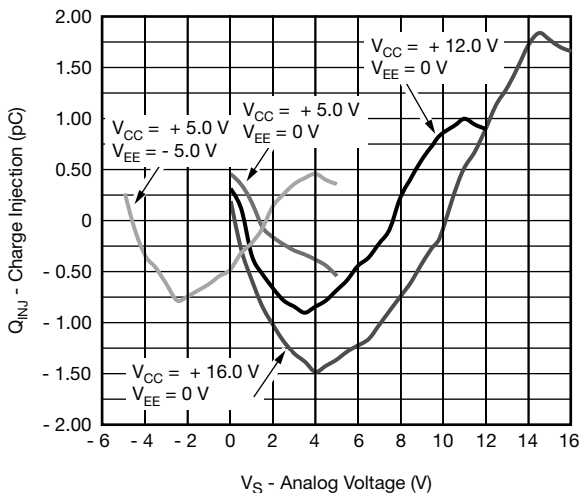
Leakage Current vs. Temperature



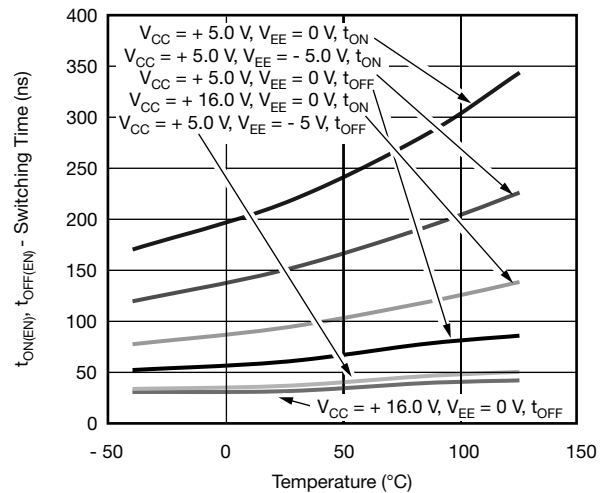
Switching Threshold vs. Supply Voltage



Insertion Loss, Off-Isolation, Crosstalk vs. Frequency



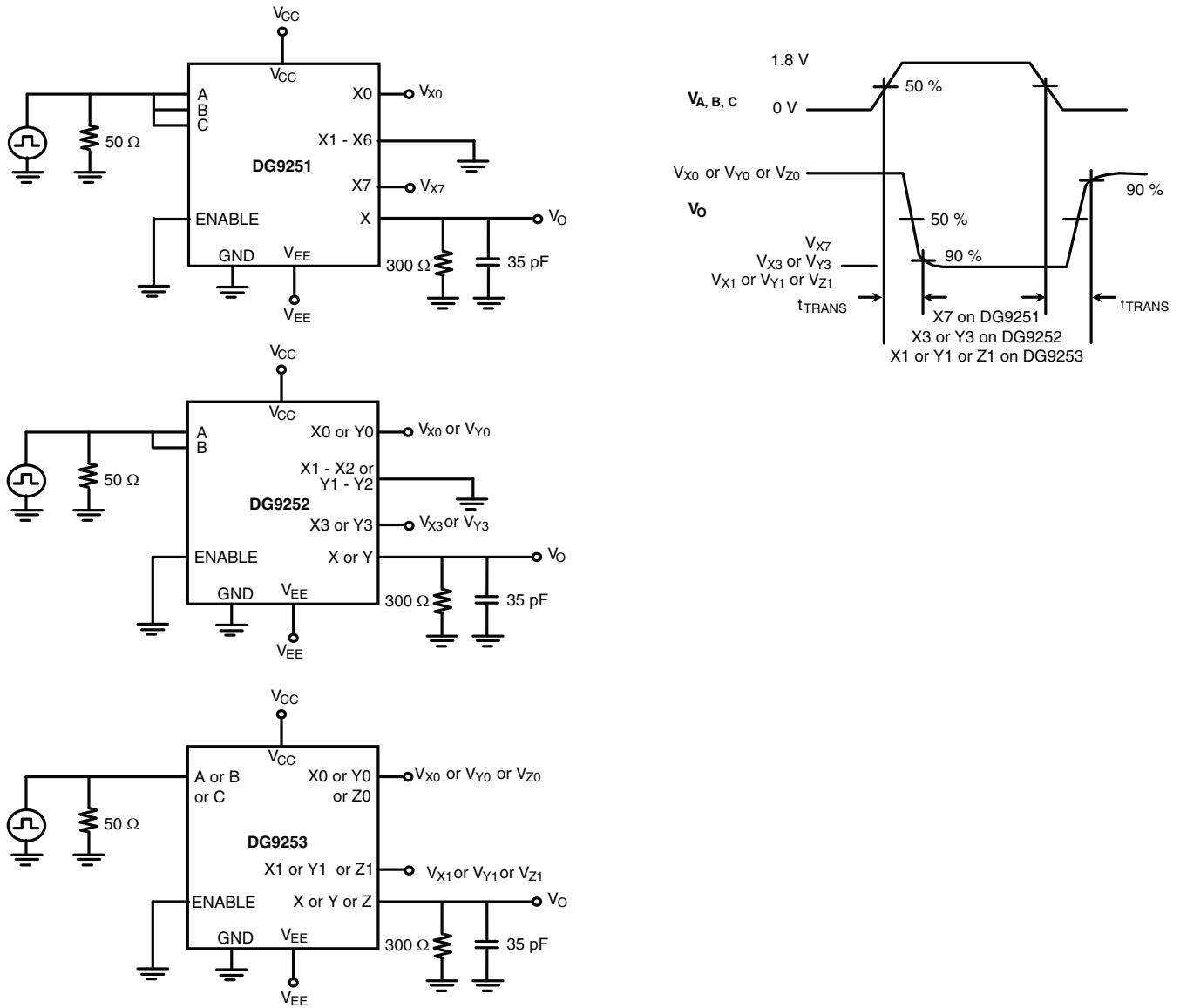
Charge Injection vs. Analog Voltage



Switching Time vs. Temperature



**TEST CIRCUITS**



**Figure 1. Transition Time**

## TEST CIRCUITS

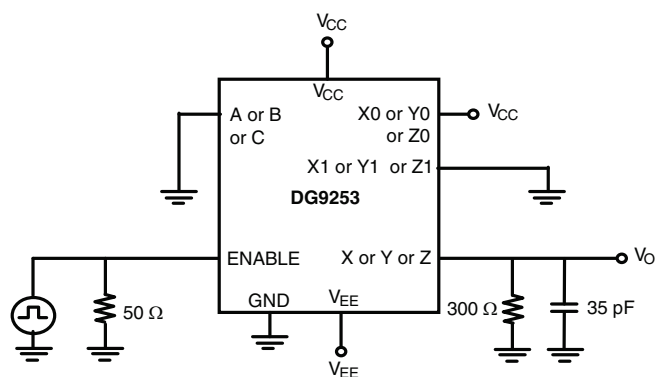
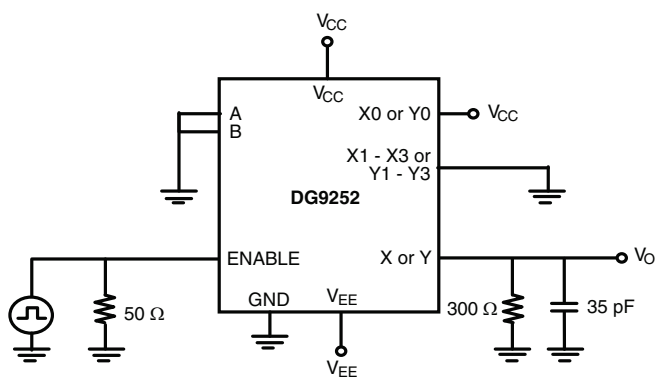
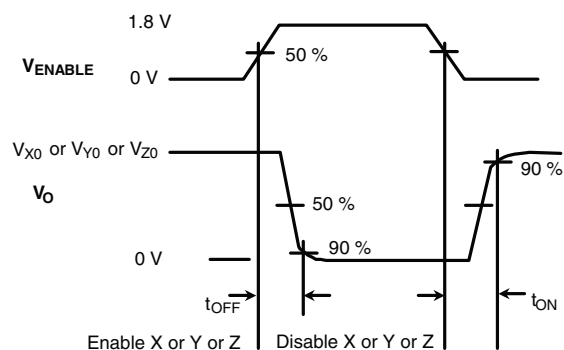
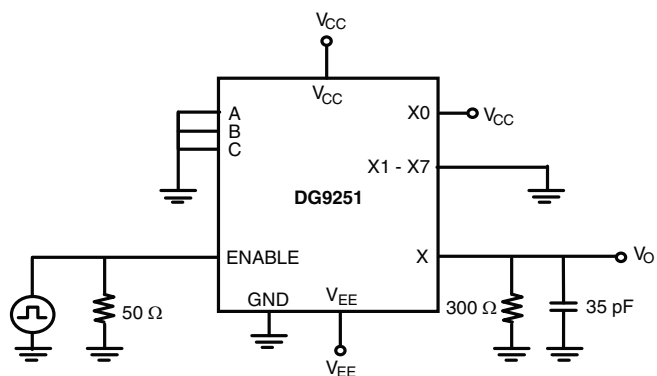
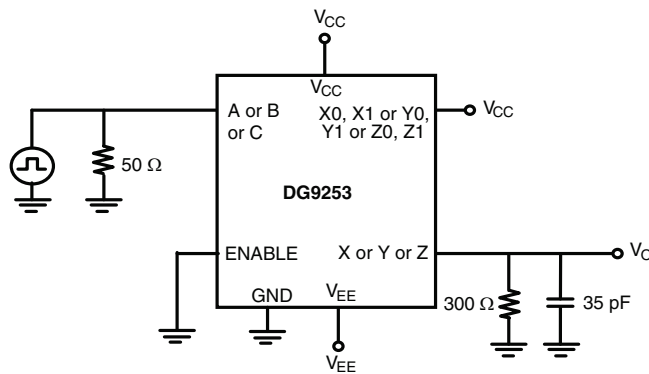
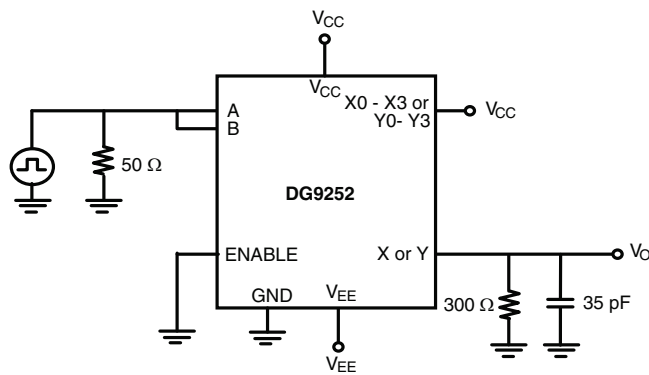
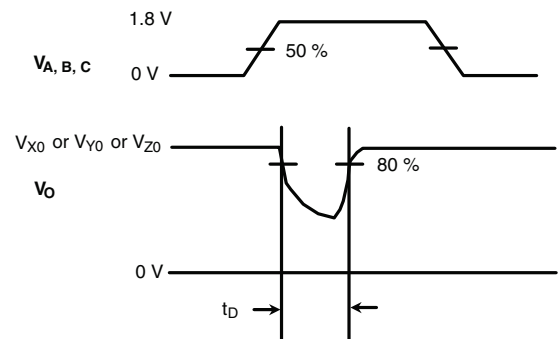
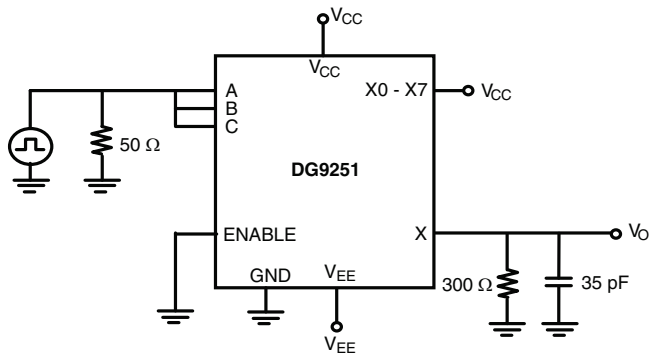


Figure 2. Enable Switching Time

**TEST CIRCUITS**



**Figure 3. Break-Before-Make**

## TEST CIRCUITS

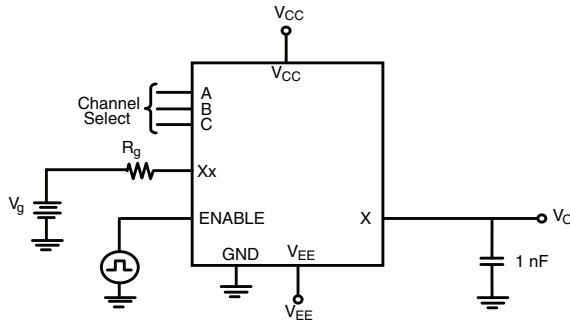
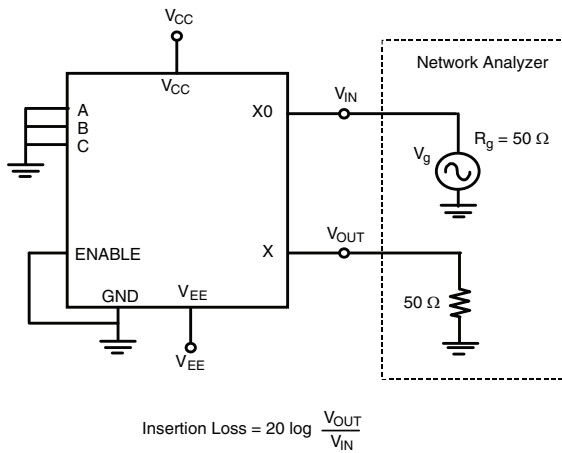
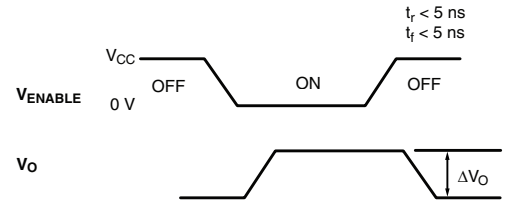
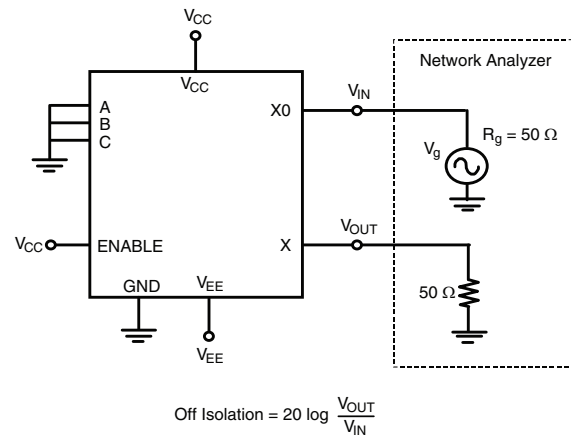


Figure 4. Charge Injection



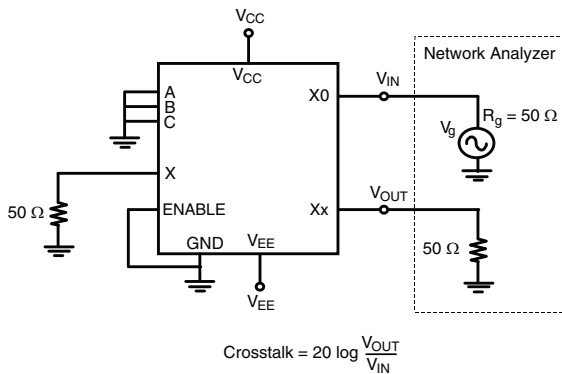
$$\text{Insertion Loss} = 20 \log \frac{V_{OUT}}{V_{IN}}$$

Figure 5. Insertion Loss



$$\text{Off Isolation} = 20 \log \frac{V_{OUT}}{V_{IN}}$$

Figure 6. Off Isolation



$$\text{Crosstalk} = 20 \log \frac{V_{OUT}}{V_{IN}}$$

Figure 7. Crosstalk

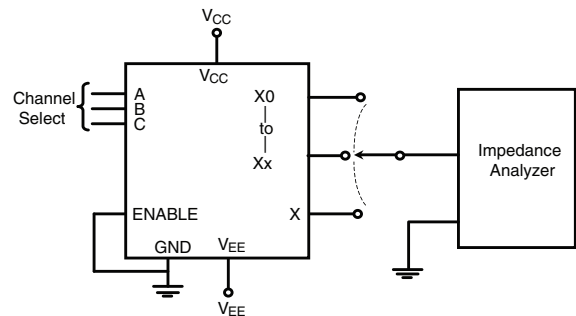


Figure 8. Source, Drain Capacitance

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