



# Precision 8-Channel / Dual 4-Channel CMOS Analog Multiplexers

## DESCRIPTION

The DG508B is an 8-channel single-ended analog multiplexer designed to connect one of eight inputs to a common output as determined by a 3-bit binary address (A<sub>0</sub>, A<sub>1</sub>, A<sub>2</sub>). The DG509B is a dual 4-channel differential analog multiplexer designed to connect one of four differential inputs to a common dual output as determined by its 2-bit binary address (A<sub>0</sub>, A<sub>1</sub>). Break-before-make switching action protects against momentary crosstalk between adjacent channels.

An on channel conducts current equally well in both directions. In the off state each channel blocks voltages up to the power supply rails. An enable (EN) function allows the user to reset the multiplexer / demultiplexer to all switches off for stacking several devices. All control inputs, addresses (A<sub>x</sub>) and enable (EN) are TTL compatible over the full specified operating temperature range.

The DG508B and DG509B are fabricated on an enhanced SG-II CMOS process that achieves improved performance on: reduced charge injection, lower device leakage, and minimized parasitic capacitance.

As the DG508, DG509 has a long history in the industry with many suppliers offering copies - and in some cases improved variations - with the best in class improvements, the Vishay Siliconix new version of the DG508B, DG509B are the superior alternatives to what is currently available.

Applications for the DG508B, DG509B include high speed and high precision data acquisition, audio signal switching and routing, ATE systems, and avionics. High performance and low power dissipation make them ideal for battery operated and remote instrumentation applications.

The DG508B and DG509B have the absolute maximum voltage rating extended to 44 V. Additionally, single supply operation is also allowed. An epitaxial layer prevents latch-up.

The DG508B and DG509B are both available in 16-lead SOIC, TSSOP, PDIP, and miniQFN (1.8 mm x 2.6 mm) package options with extended temperature range of -40 °C to +125 °C.

For more information, refer to Vishay Siliconix DG508B, DG509B evaluation board note.

## FEATURES

- Operate with single or dual power supply
- V+ to V- analog signal swing range
- 44 V power supply maximum rating
- Extended operate temperature range: -40 °C to +125 °C
- Low leakage typically < 3 pA
- Low charge injection - Q<sub>INJ</sub> = 2 pC
- Low power - I<sub>SUPPLY</sub>: 10 µA
- TTL compatible logic
- > 250 mA latch-up current per JESD78
- Available in SOIC16, TSSOP16, PDIP, and miniQFN16 packages
- Superior alternative to:
  - ADG508A, DG508A, HI-508
  - ADG509A, DG509A, HI-509
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



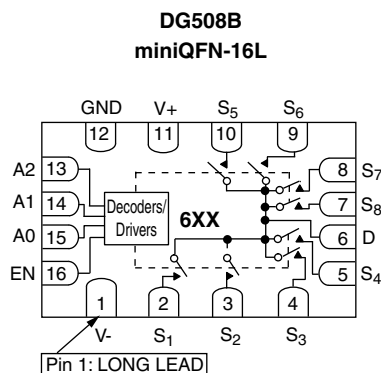
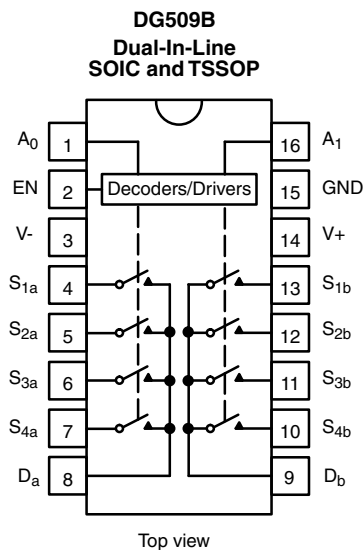
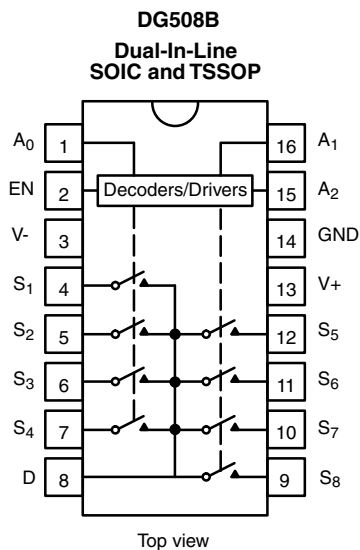
## BENEFITS

- Reduced switching errors
- Reduced glitching
- Improved data throughput
- Reduced power consumption
- Increased ruggedness
- Wide supply ranges (± 5 V to ± 20 V)

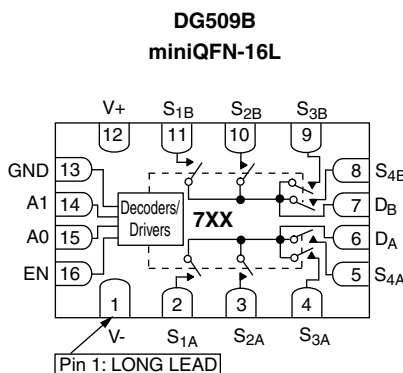
## APPLICATIONS

- Data acquisition systems
- Audio and video signal routing
- ATE systems
- Medical instrumentation

## FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



Top View  
Device Marking: 6XX  
Traceability Code:  
6 is DG508BEN  
XX = Date/Lot



Top View  
Device Marking: 7XX  
Traceability Code:  
7 is DG509BEN  
XX = Date/Lot

## TRUTH TABLES AND ORDERING INFORMATION

| TRUTH TABLE (DG508B) |                |                |    |           |
|----------------------|----------------|----------------|----|-----------|
| A <sub>2</sub>       | A <sub>1</sub> | A <sub>0</sub> | EN | ON SWITCH |
| X                    | X              | X              | 0  | None      |
| 0                    | 0              | 0              | 1  | 1         |
| 0                    | 0              | 1              | 1  | 2         |
| 0                    | 1              | 0              | 1  | 3         |
| 0                    | 1              | 1              | 1  | 4         |
| 1                    | 0              | 0              | 1  | 5         |
| 1                    | 0              | 1              | 1  | 6         |
| 1                    | 1              | 0              | 1  | 7         |
| 1                    | 1              | 1              | 1  | 8         |

| TRUTH TABLE (DG509B) |                |    |           |
|----------------------|----------------|----|-----------|
| A <sub>1</sub>       | A <sub>0</sub> | EN | ON SWITCH |
| X                    | X              | 0  | None      |
| 0                    | 0              | 1  | 1         |
| 0                    | 1              | 1  | 2         |
| 1                    | 0              | 1  | 3         |
| 1                    | 1              | 1  | 4         |

Logic "0" = V<sub>IL</sub> ≤ 0.8 V  
 Logic "1" = V<sub>IH</sub> ≥ 2 V  
 X = Do not care



| ORDERING INFORMATION (DG508B)  |                |                 |
|--------------------------------|----------------|-----------------|
| TEMP. RANGE                    | PACKAGE        | PART NUMBER     |
| -40 °C to +125 °C <sup>a</sup> | 16-Pin SOIC    | DG508BEY-T1-E3  |
|                                | 16-Pin TSSOP   | DG508BEQ-T1-E3  |
|                                | 16-Pin PDIP    | DG508BEJ-E3     |
|                                | 16-Pin MiniQFN | DG508BEN-T1-GE4 |

| ORDERING INFORMATION (DG509B)  |                |                 |
|--------------------------------|----------------|-----------------|
| TEMP. RANGE                    | PACKAGE        | PART NUMBER     |
| -40 °C to +125 °C <sup>a</sup> | 16-Pin SOIC    | DG509BEY-T1-E3  |
|                                | 16-Pin TSSOP   | DG509BEQ-T1-E3  |
|                                | 16-Pin PDIP    | DG509BEJ-E3     |
|                                | 16-Pin MiniQFN | DG509BEN-T1-GE4 |

**Note**

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

| ABSOLUTE MAXIMUM RATINGS                                      |                                 |  |      |
|---|---------------------------------|--|------|
| PARAMETER   |                                 | LIMIT  | UNIT |
| Voltages Referenced to V-                                     | V+                              | 44   | V    |
|   | GND                             | 25   |      |
| Digital Inputs <sup>a</sup> , V <sub>S</sub> , V <sub>D</sub> |                                 | (V-) - 2 to (V+) + 2<br>or 20 mA, whichever occurs first |      |
| Current (Any terminal)  |                                 | 30   | mA   |
| Peak Current, S or D (Pulsed at 1 ms, 10 % duty cycle max.)   |                                 | 100  |      |
| Storage Temperature   | (EY, EQ, EJ, EN suffix)         | -65 to +150  | °C   |
| Power Dissipation (Packages) <sup>b</sup>                     | 16-Pin Narrow SOIC <sup>c</sup> | 600  | mW   |
|   | 16-Pin TSSOP <sup>d</sup>       | 450  |      |
|   | 16-Pin PDIP <sup>e</sup>        | 510  |      |
|   | 16-Pin miniQFN <sup>f</sup>     | 525  |      |
| Thermal Resistance (θJA) <sup>b</sup>                         | 16-Pin Narrow SOIC <sup>c</sup> | 125  | °C/W |
|   | 16-Pin TSSOP <sup>d</sup>       | 178  |      |
|   | 16-Pin PDIP <sup>e</sup>        | 159.6  |      |
|   | 16-Pin miniQFN <sup>f</sup>     | 152  |      |

**Notes**

- a. Signals on SX, DX or INX exceeding V+ or V- will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- b. All leads soldered or welded to PC board.
- c. Derate 8 mW/°C above 70 °C.
- d. Derate 5.6 mW/°C above 70 °C.
- e. Derate 6.3 mW/°C above 70 °C.
- f. Derate 6.6 mW/°C above 70 °C.



| SPECIFICATIONS                         |                     |   |                    |                   |                   |                   |                   |                   |               |    |
|--|---------------------|---|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------|----|
| PARAMETER                              | SYMBOL              | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>$V_+ = 15\text{ V}, V_- = -15\text{ V} (\pm 10\%)$<br>$V_{AX}, V_{EN} = 2\text{ V}, 0.8\text{ V}^a$ | 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> |               |    |
| <b>Analog Switch</b>                   |                     |   |                    |                   |                   |                   |                   |                   |               |    |
| Analog Signal Range <sup>e</sup>       | $V_{ANALOG}$        |   | Full               | -                 | -15               | 15                | -15               | 15                | V             |    |
| Drain-Source On-Resistance             | $R_{DS(on)}$        | $V_D = \pm 10\text{ V}, I_S = -1\text{ mA}$   | Room               | 180               | -                 | 380               | -                 | 380               | $\Omega$      |    |
|  |                     |   | Full               | -                 | -                 | 480               | -                 | 450               |               |    |
| $R_{DS(on)}$ Matching                  | $\Delta R_{DS(on)}$ | $V_D = \pm 10\text{ V}$   | Room               | 10                | -                 | -                 | -                 | -                 |               |    |
| Source Off Leakage Current             | $I_{S(off)}$        |   | Room               | -                 | -1                | 1                 | -1                | 1                 |               |    |
|  |                     |   | Full               | -                 | -50               | 50                | -50               | 50                |               |    |
| Drain Off Leakage Current              | $I_{D(off)}$        | $V_D = \pm 10\text{ V}$<br>$V_S = \mp 10\text{ V}$<br>$V_{EN} = 0\text{ V}$   | DG508B             | Room              | -                 | -1                | 1                 | -1                | 1             | nA |
|  |                     |   |                    | Full              | -                 | -100              | 100               | -100              | 100           |    |
|  |                     |   | DG509B             | Room              | -                 | -1                | 1                 | -1                | 1             |    |
|  |                     |   |                    | Full              | -                 | -50               | 50                | -50               | 50            |    |
| Drain On Leakage Current               | $I_{D(on)}$         | $V_S = V_D = \mp 10\text{ V}$<br>sequence each switch on  | DG508B             | Room              | -                 | -1                | 1                 | -1                | 1             |    |
|  |                     |   |                    | Full              | -                 | -100              | 100               | -100              | 100           |    |
|  |                     |   | DG509B             | Room              | -                 | -1                | 1                 | -1                | 1             |    |
|  |                     |   |                    | Full              | -                 | -50               | 50                | -50               | 50            |    |
| <b>Digital Control</b>                 |                     |   |                    |                   |                   |                   |                   |                   |               |    |
| Logic High Input Voltage               | $V_{INH}$           |   | Full               | -                 | 2                 | -                 | 2                 | -                 | V             |    |
| Logic Low Input Voltage                | $V_{INL}$           |   | Full               | -                 | -                 | 0.8               | -                 | 0.8               |               |    |
| Logic High Input Current               | $I_{IH}$            | $V_{AX}, V_{EN} = 2\text{ V}$   | Full               | -                 | -1                | 1                 | -1                | 1                 | $\mu\text{A}$ |    |
| Logic Low Input Current                | $I_{IL}$            | $V_{AX}, V_{EN} = 0.8\text{ V}$   | Full               | -                 | -1                | 1                 | -1                | 1                 |               |    |
| Logic Input Capacitance <sup>e</sup>   | $C_{IN}$            | $f = 1\text{ MHz}$  | Room               | 4                 | -                 | -                 | -                 | -                 | pF            |    |
| <b>Dynamic Characteristics</b>         |                     |   |                    |                   |                   |                   |                   |                   |               |    |
| Transition Time                        | $t_{TRANS}$         | $V_{S1} = +10\text{ V}/-10\text{ V},$<br>$V_{S8} = -10\text{ V}/+10\text{ V},$<br>$R_L = 1\text{ M}\Omega, C_L = 35\text{ pF}$                          | Room               | 145               | -                 | 300               | -                 | 300               |               |    |
|  |                     |   | Full               | -                 | -                 | 400               | -                 | 400               |               |    |
| Break-Before-Make Interval             | $t_{OPEN}$          | $V_{S1} = V_{S8} = 5\text{ V}, C_L = 35\text{ pF},$<br>$R_L = 1\text{ k}\Omega$   | Room               | 37                | 15                | -                 | 15                | -                 | ns            |    |
|  |                     |   | Full               | -                 | 1                 | -                 | 1                 | -                 |               |    |
| Enable Turn-On Time                    | $t_{ON(EN)}$        | $V_{S1} = 5\text{ V}, V_{S2} \text{ to } V_{S8} = 0\text{ V},$<br>$R_L = 1\text{ k}\Omega, C_L = 35\text{ pF}$  | Room               | 100               | -                 | 250               | -                 | 250               |               |    |
|  |                     |   | Full               | -                 | -                 | 340               | -                 | 340               |               |    |
| Enable Turn-Off Time                   | $t_{OFF(EN)}$       |   | Room               | 90                | -                 | 240               | -                 | 240               |               |    |
|  |                     |   | Full               | -                 | -                 | 300               | -                 | 300               |               |    |
| Charge Injection <sup>e</sup>          | $Q_{INJ}$           | $C_L = 1\text{ nF}, R_{GEN} = 0\text{ W}, V_{GEN} = 0\text{ V}$   | Full               | 2                 | -                 | -                 | -                 | -                 | pC            |    |
| Off Isolation <sup>e</sup>             | OIRR                | $C_L = 5\text{ pF}, R_L = 50\text{ }\Omega, f = 1\text{ MHz}$   | Room               | -81               | -                 | -                 | -                 | -                 | dB            |    |
| Crosstalk <sup>e</sup>                 | $X_{TALK}$          |   | Room               | -88               | -                 | -                 | -                 | -                 |               |    |
| -3 dB Bandwidth <sup>e</sup>           | BW                  | $R_L = 50\text{ }\Omega$  | Room               | 250               | -                 | -                 | -                 | -                 | MHz           |    |
| Total Harmonic Distortion <sup>e</sup> | THD                 | $R_L = 10\text{ k}\Omega, 5 V_{rms}$<br>$f = 20\text{ Hz to } 20\text{ kHz}$  | Room               | 0.04              | -                 | -                 | -                 | -                 | %             |    |
| Source Off Capacitance <sup>e</sup>    | $C_{S(off)}$        | $f = 1\text{ MHz}$  | Room               | 3                 | -                 | -                 | -                 | -                 | pF            |    |
| Drain Off Capacitance <sup>e</sup>     | $C_{D(off)}$        |   | DG508B             | Room              | 13                | -                 | -                 | -                 |               | -  |
|  |                     |   | DG509B             | Room              | 8                 | -                 | -                 | -                 |               | -  |
| Drain On Capacitance <sup>e</sup>      | $C_{D(on)}$         |   | DG508B             | Room              | 18                | -                 | -                 | -                 |               | -  |
|  |                     | DG509B  | Room               | 11                | -                 | -                 | -                 | -                 |               |    |
| <b>Power Supply</b>                    |                     |   |                    |                   |                   |                   |                   |                   |               |    |
| Positive Supply Current                | I+                  | $V_{AX}, V_{EN} = 0.8\text{ V or } 2.4\text{ V}$  | Room               | 0.01              | -                 | 0.2               | -                 | 0.2               | mA            |    |
|  |                     |   | Full               | -                 | -                 | 0.3               | -                 | 0.3               |               |    |
| Negative Supply Current                | I-                  |   | Full               | 0.06              | -10               | -                 | -10               | -                 | $\mu\text{A}$ |    |



| SPECIFICATIONS (Single Supply 12 V)    |                     |  |  |                   |                   |                   |                   |                   |               |     |    |
|--|---------------------|--|--|-------------------|-------------------|-------------------|-------------------|-------------------|---------------|-----|----|
| PARAMETER                              | SYMBOL              | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>$V_+ = 12\text{ V}$ , $V_- = 0\text{ V}$ ( $\pm 10\%$ )<br>$V_{AX}$ , $V_{EN} = 2\text{ V}$ , $0.8\text{ V}^a$ | 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> |               |     |    |
| <b>Analog Switch</b>                   |                     |  |  |                   |                   |                   |                   |                   |               |     |    |
| Analog Signal Range <sup>e</sup>       | $V_{ANALOG}$        |  | Full   | -                 | 0                 | 12                | 0                 | 12                | V             |     |    |
| On-Resistance                          | $R_{DS(on)}$        | $V_D = 10\text{ V}/0\text{ V}$ , $I_S = 1\text{ mA}$   | Room   | 265               | -                 | 500               | -                 | 500               | $\Omega$      |     |    |
| $R_{DS(on)}$ Matching                  | $\Delta R_{DS(on)}$ |  | Full   | -                 | -                 | 650               | -                 | 600               |               |     |    |
| Switch Off Leakage Current             | $I_{S(off)}$        | $V_+ = 12\text{ V}$ , $V_- = 0\text{ V}$<br>$V_D = 0\text{ V}/10\text{ V}$ ,<br>$V_S = 10\text{ V}/0\text{ V}$   | Room   | -                 | -1                | 1                 | -1                | 1                 | nA            |     |    |
|  |                     |  | Full   | -                 | -50               | -50               | -50               | 50                |               |     |    |
|  | $I_{D(off)}$        |  | DG508B   | Room              | -                 | -1                | 1                 | -1                |               | 1   |    |
|  |                     |  | DG508B   | Full              | -                 | -100              | 100               | -100              |               | 100 |    |
|  | $I_{D(off)}$        |  | DG509B   | Room              | -                 | -1                | 1                 | -1                |               | 1   |    |
|  |                     |  | DG509B   | Full              | -                 | -50               | 50                | -50               |               | 50  |    |
| Channel On Leakage Current             | $I_{D(on)}$         | $V_+ = 12\text{ V}$ , $V_- = 0\text{ V}$<br>$V_S = V_D = 0\text{ V}/10\text{ V}$   | DG508B   | Room              | -                 | -1                | 1                 | -1                | 1             | nA  |    |
|  |                     |  | DG508B   | Full              | -                 | -100              | 100               | -100              | 100           |     |    |
|  |                     |  | DG509B   | Room              | -                 | -1                | 1                 | -1                | 1             |     |    |
|  |                     |  | DG509B   | Full              | -                 | -50               | 50                | -50               | 50            |     |    |
| <b>Digital Control</b>                 |                     |  |  |                   |                   |                   |                   |                   |               |     |    |
| Logic High Input Voltage               | $V_{INH}$           |  | Full   | -                 | 2                 | -                 | 2                 | -                 | V             |     |    |
| Logic Low Input Voltage                | $V_{INL}$           |  | Full   | -                 | -                 | 0.8               | -                 | 0.8               |               |     |    |
| Logic High Input Current               | $I_{IH}$            | $V_{AX}$ , $V_{EN} = 2\text{ V}$   | Full   | -                 | -1                | 1                 | -1                | 1                 | $\mu\text{A}$ |     |    |
| Logic Low Input Current                | $I_{IL}$            | $V_{AX}$ , $V_{EN} = 0.8\text{ V}$   | Full   | -                 | -1                | 1                 | -1                | 1                 |               |     |    |
| Logic Input Capacitance <sup>e</sup>   | $C_{IN}$            | $f = 1\text{ MHz}$   | Room   | 4                 | -                 | -                 | -                 | -                 | pF            |     |    |
| <b>Dynamic Characteristics</b>         |                     |  |  |                   |                   |                   |                   |                   |               |     |    |
| Transition Time                        | $t_{TRANS}$         | $V_{S1} = 10\text{ V}/0\text{ V}$ , $V_{S8} = 0\text{ V}/10\text{ V}$ ,<br>$R_L = 1\text{ M}\Omega$ , $C_L = 35\text{ pF}$   | Room   | 165               | -                 | 400               | -                 | 400               | ns            |     |    |
|  |                     |  | Full   | -                 | -                 | 550               | -                 | 500               |               |     |    |
| Break-Before-Make Interval             | $t_{OPEN}$          | $V_{S1} = V_{S8} = 5\text{ V}$ , $C_L = 35\text{ pF}$ ,<br>$R_L = 1\text{ k}\Omega$  | Room   | 37                | 15                | -                 | 15                | -                 | ns            |     |    |
|  |                     |  | Full   | -                 | 1                 | -                 | 1                 | -                 |               |     |    |
| Enable Turn-On Time                    | $t_{ON(EN)}$        | $V_{S1} = 5\text{ V}$ , $V_{S2}$ to $V_{S8} = 0\text{ V}$ ,<br>$R_L = 1\text{ k}\Omega$ , $C_L = 35\text{ pF}$   | Room   | 125               | -                 | 300               | -                 | 300               | ns            |     |    |
|  |                     |  | Full   | -                 | -                 | 550               | -                 | 425               |               |     |    |
| Enable Turn-Off Time                   | $t_{OFF(EN)}$       |  | Room   | 75                | -                 | 250               | -                 | 250               |               |     |    |
|  |                     |  | Full   | -                 | -                 | 350               | -                 | 300               |               |     |    |
| Charge Injection <sup>e</sup>          | $Q_{INJ}$           |  | $C_L = 1\text{ nF}$ , $R_{GEN} = 0\ \Omega$ , $V_{GEN} = 0\text{ V}$ | Full              | 2.5               | -                 | -                 | -                 |               | -   | pC |
| Off Isolation <sup>e</sup>             | OIRR                |  | $C_L = 5\text{ pF}$ , $R_L = 50\ \Omega$<br>$f = 1\text{ MHz}$       | Room              | -80               | -                 | -                 | -                 |               | -   | dB |
| Crosstalk <sup>e</sup>                 | $X_{TALK}$          | Room   |  | -88               | -                 | -                 | -                 | -                 |               |     |    |
| -3 dB Bandwidth <sup>e</sup>           | BW                  | $R_L = 50\ \Omega$   | Room   | 200               | -                 | -                 | -                 | -                 | MHz           |     |    |
| Total Harmonic Distortion <sup>e</sup> | THD                 | $R_L = 10\text{ k}\Omega$ , $5\text{ V}_{RMS}$ ,<br>$f = 20\text{ Hz}$ to $20\text{ kHz}$  | Room   | 0.26              | -                 | -                 | -                 | -                 | %             |     |    |
| Source Off Capacitance <sup>e</sup>    | $C_{S(off)}$        | $f = 1\text{ MHz}$   | Room   | 2                 | -                 | -                 | -                 | -                 | pF            |     |    |
| Drain Off Capacitance <sup>e</sup>     | $C_{D(off)}$        |  |  | DG508B            | 13                | -                 | -                 | -                 |               | -   |    |
|  |                     |  |  | DG509B            | 8                 | -                 | -                 | -                 |               | -   |    |
| Channel On Capacitance <sup>e</sup>    | $C_{D(on)}$         |  |  | DG508B            | 17                | -                 | -                 | -                 |               | -   |    |
|  |                     |  |  | DG509B            | 12                | -                 | -                 | -                 |               | -   |    |

| SPECIFICATIONS (Single Supply 12 V) |        |   |                    |                   |                   |                   |                   |                   |      |
|-------------------------------------|--------|---|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| PARAMETER                           | SYMBOL | TEST CONDITIONS<br>UNLESS OTHERWISE<br>SPECIFIED<br>$V_+ = 12\text{ V}$ , $V_- = 0\text{ V}$ ( $\pm 10\%$ )<br>$V_{AX}$ , $V_{EN} = 2\text{ V}$ , $0.8\text{ V}$ <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> |      |
| <b>Power Supply</b>                 |        |   |                    |                   |                   |                   |                   |                   |      |
| Positive Supply Current             | I+     | $V_{AX}$ , $V_{EN} = 0.8\text{ V}$ or $2.4\text{ V}$  | Room               | 0.01              | -                 | 0.2               | -                 | 0.2               | mA   |
|                                     |        |   | Full               | -                 | -                 | 0.3               | -                 | 0.3               |      |

**Notes**

- $V_{AX}$ ,  $V_{EN}$  = input voltage perform proper function.
- Room = 25 °C, Full = as determined by the operating temperature suffix.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this datasheet.
- Guaranteed by design, not subject to production test.
- $\Delta R_{DS(on)} = R_{DS(on)} \text{ max.} - R_{DS(on)} \text{ min.}$

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.

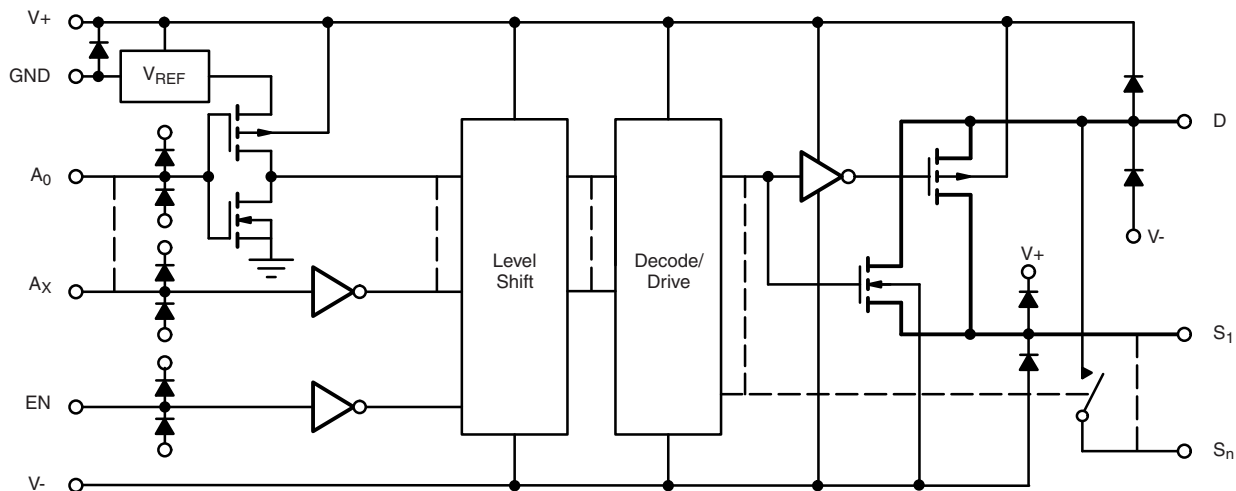
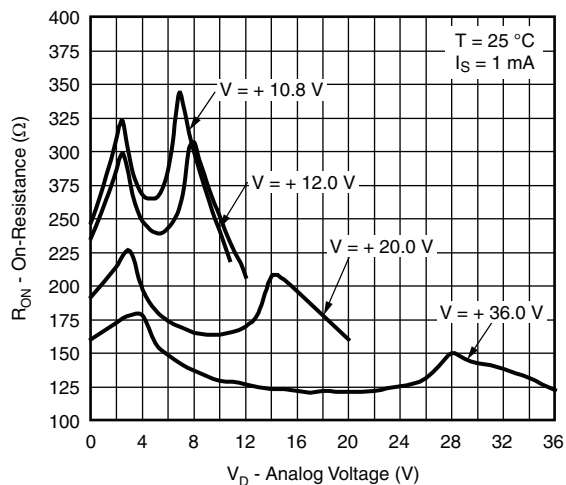
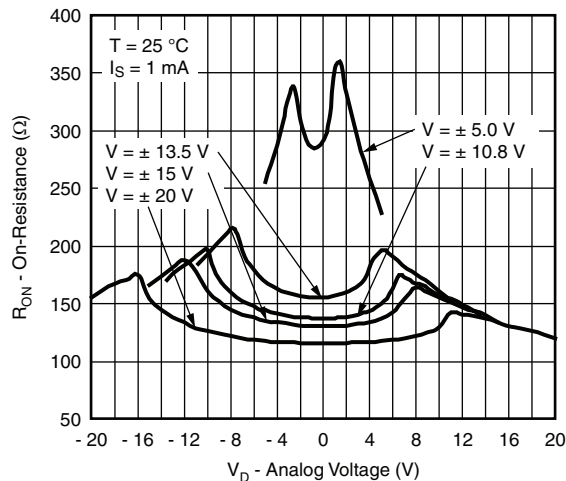
**SCHEMATIC DIAGRAM (Typical Channel)**


Fig. 1

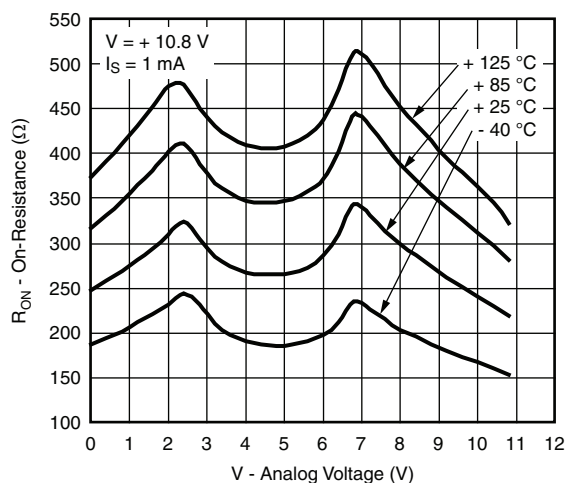
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



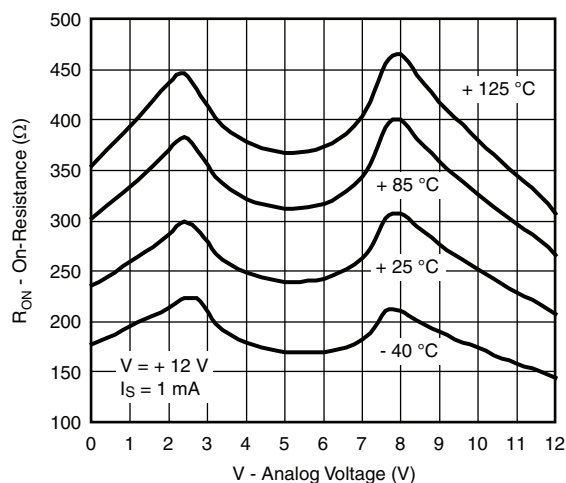
**On-Resistance vs.  $V_D$  and Single Supply Voltage**



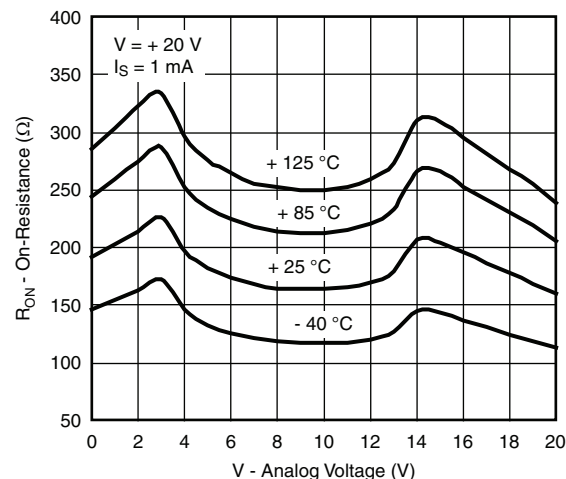
**On-Resistance vs.  $V_D$  and Dual Supply Voltage**



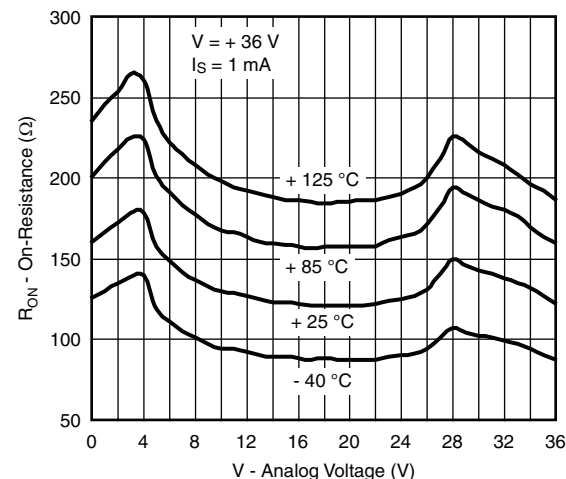
**On-Resistance vs. Analog Voltage and Temperature**



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



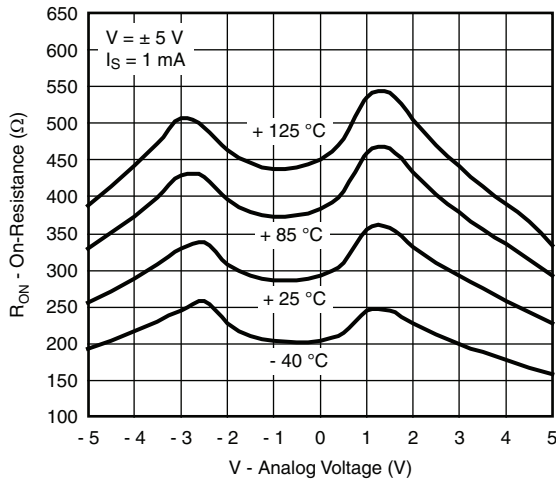
**On-Resistance vs. Analog Voltage and Temperature**



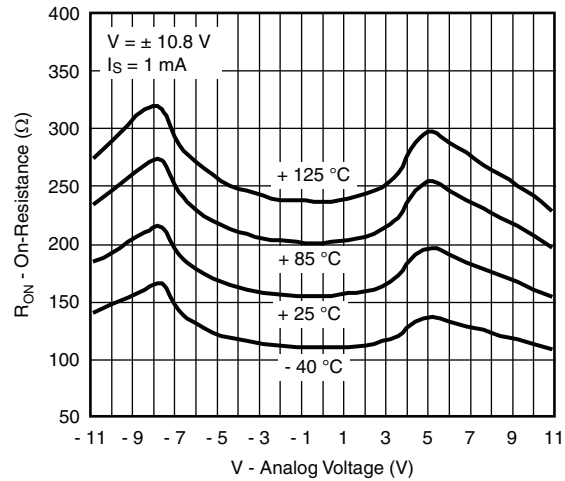
**On-Resistance vs. Analog Voltage and Temperature**



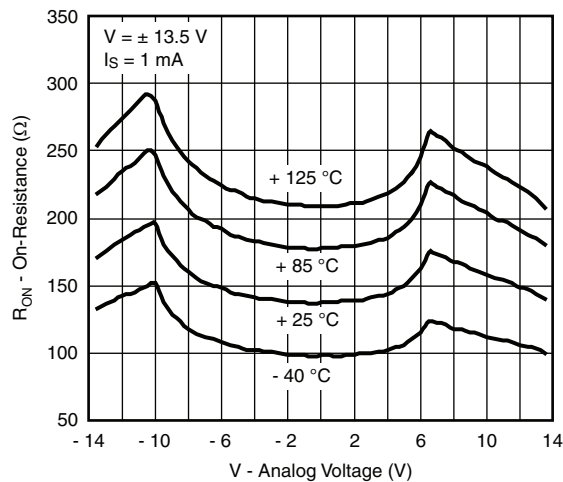
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



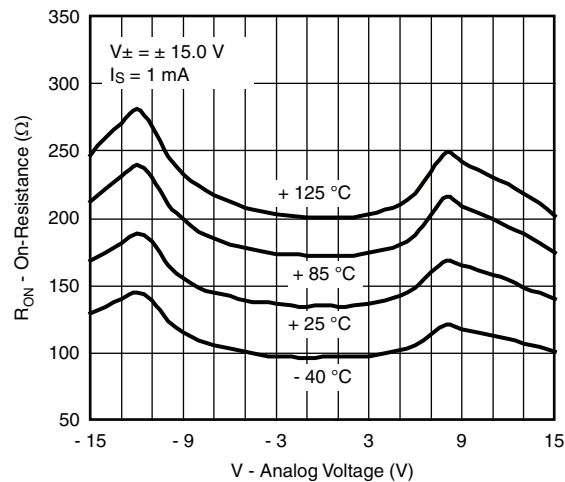
On-Resistance vs. Analog Voltage and Temperature



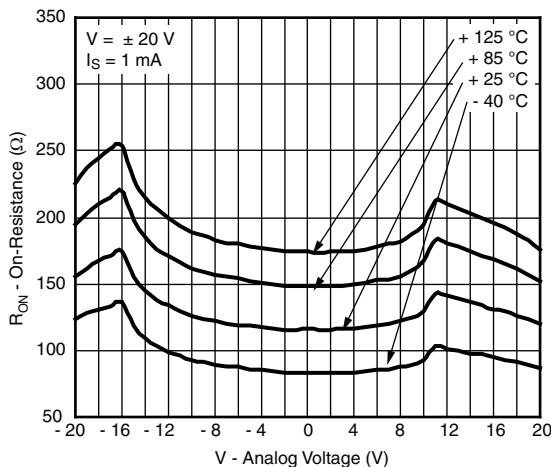
On-Resistance vs. Analog Voltage and Temperature



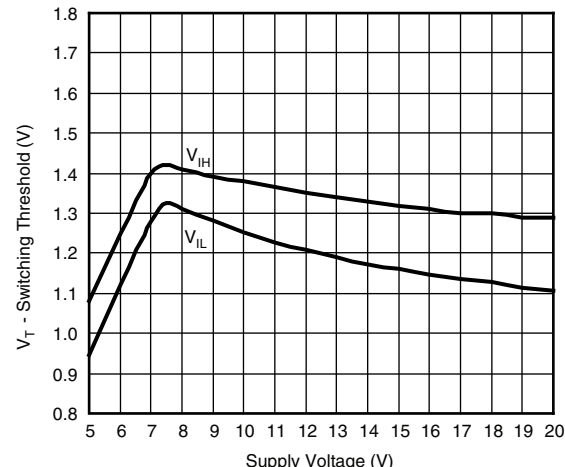
On-Resistance vs. Analog Voltage and Temperature



On-Resistance vs. Analog Voltage and Temperature



On-Resistance vs. Analog Voltage and Temperature

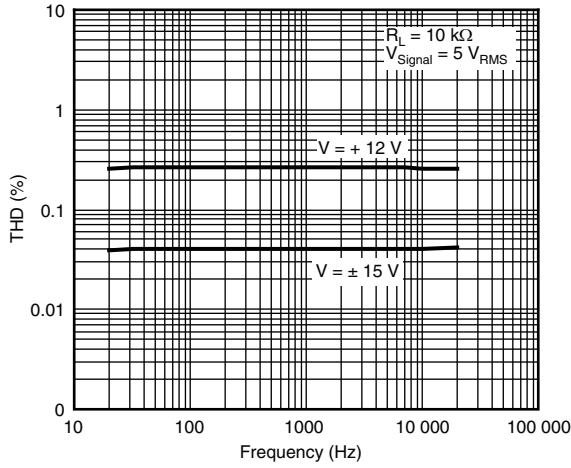


Switching Threshold vs. Supply Voltage

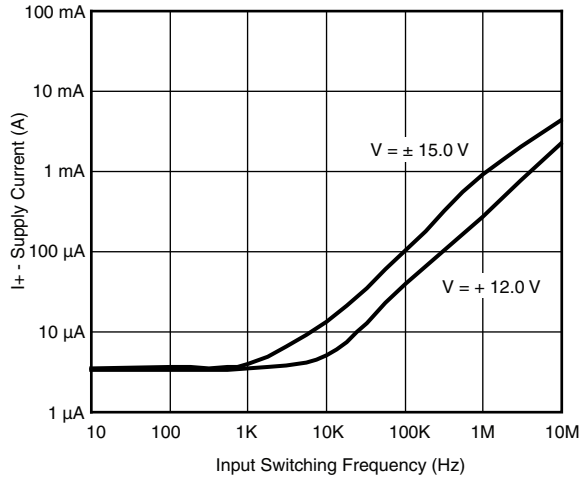




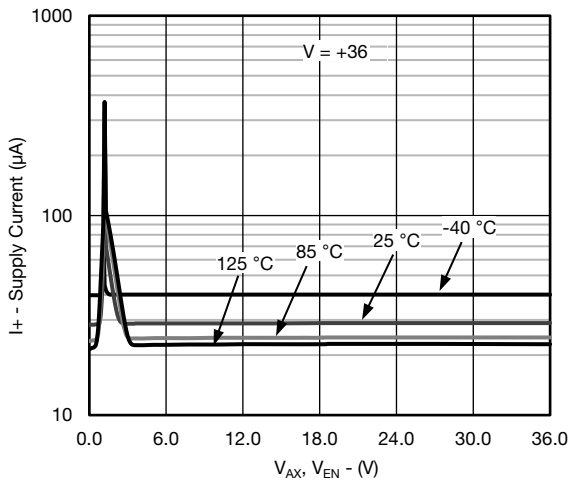
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



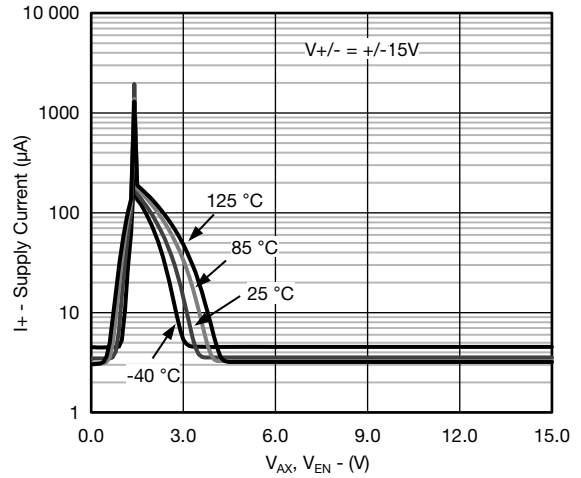
**THD vs. Frequency**



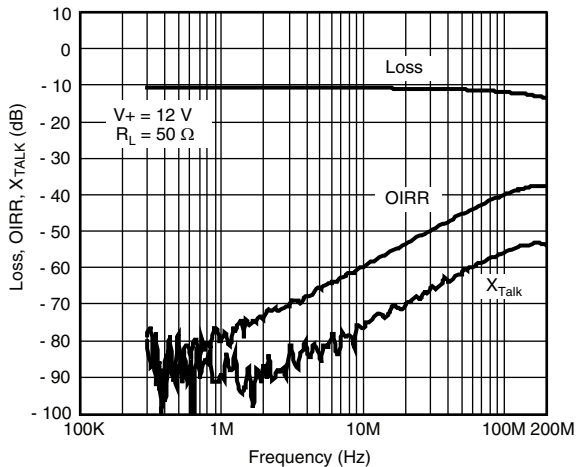
**Supply Current vs. Input Switching Frequency**



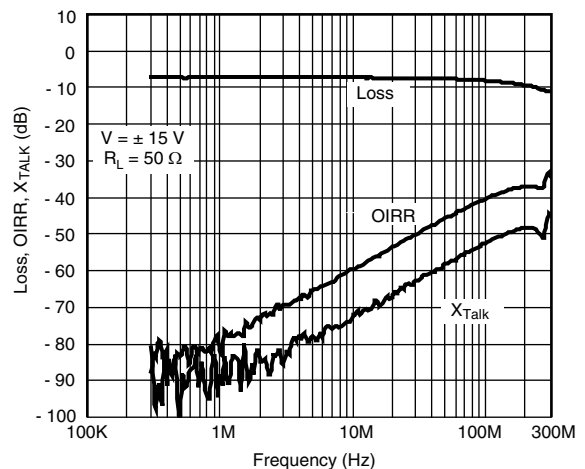
**Supply Current vs.  $V_{\text{AX}}, V_{\text{EN}}$**



**Supply Current vs.  $V_{\text{AX}}, V_{\text{EN}}$**



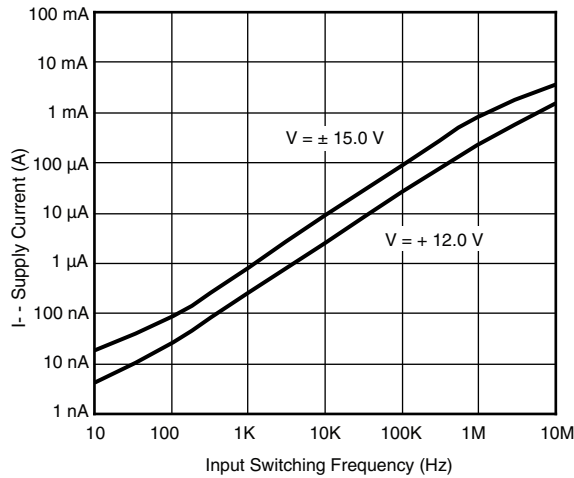
**Insertion Loss, Off-Isolation, Crosstalk vs. Frequency**



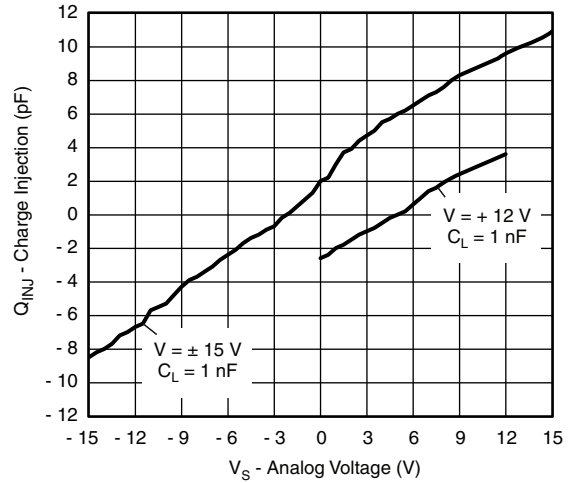
**Insertion Loss, Off-Isolation, Crosstalk vs. Frequency**



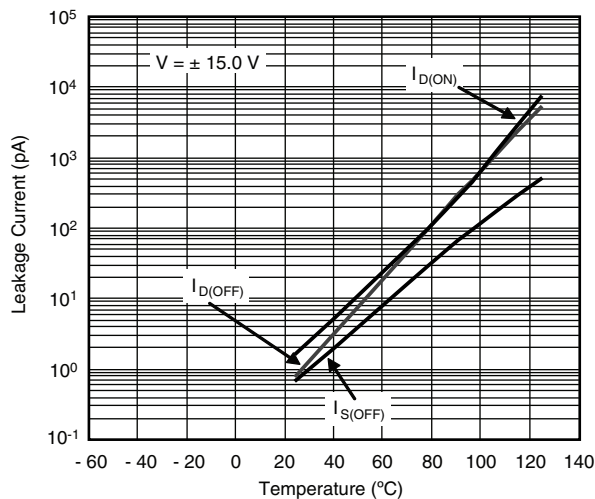
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



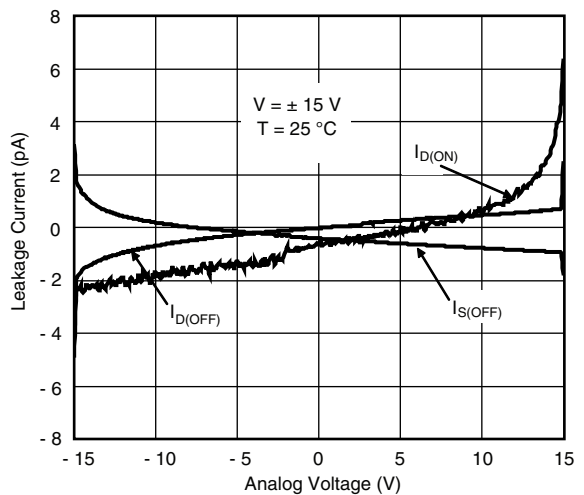
**Supply Current vs. Input Switching Frequency**



**Charge Injection vs. Analog Voltage**



**Leakage Current vs. Temperature**



**Leakage Current vs. Analog Voltage**

TEST CIRCUITS

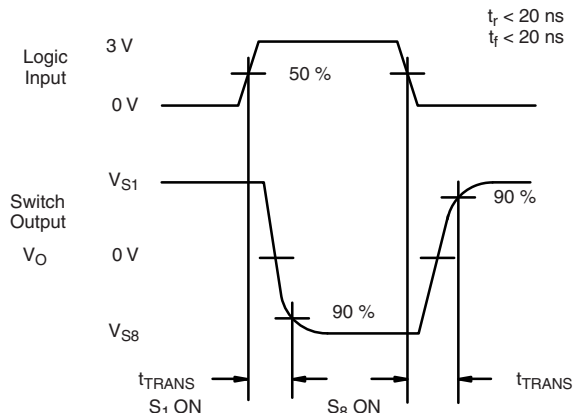
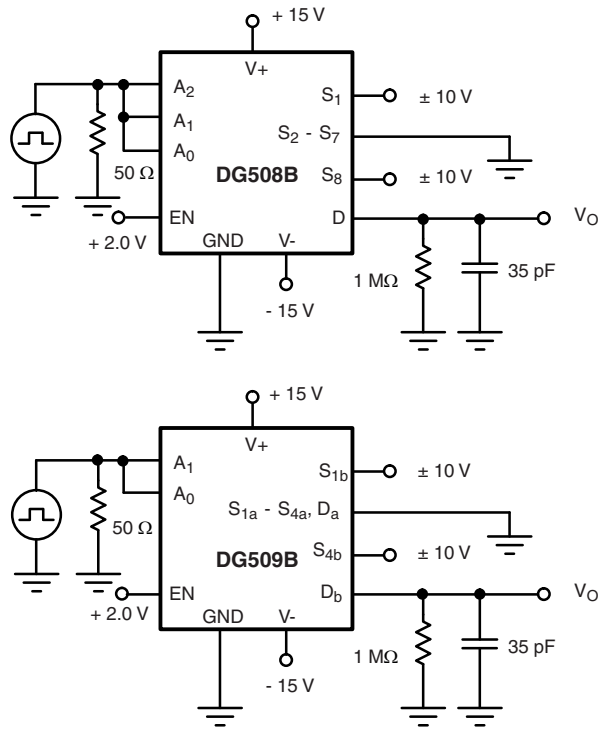


Fig. 2 - Transition Time

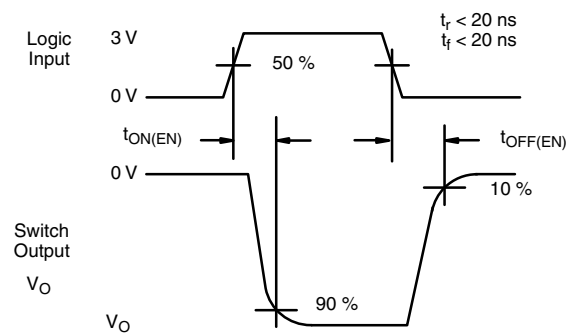
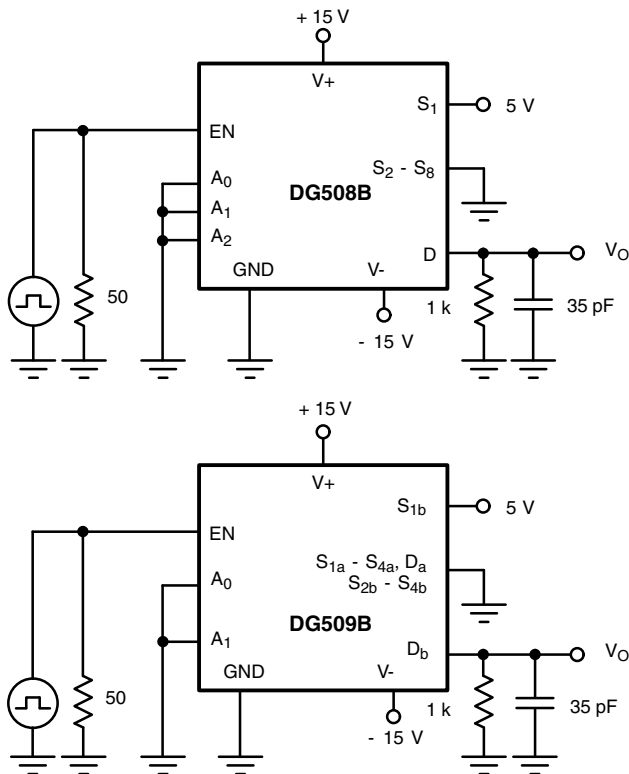


Fig. 3 - Enable Switching Time

TEST CIRCUITS

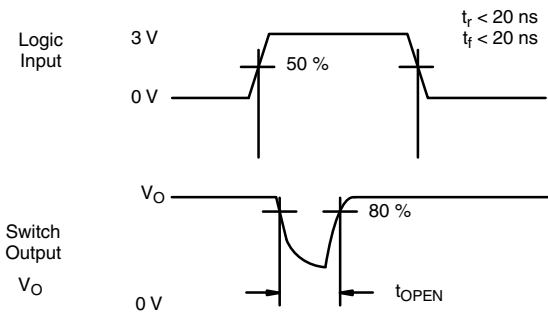
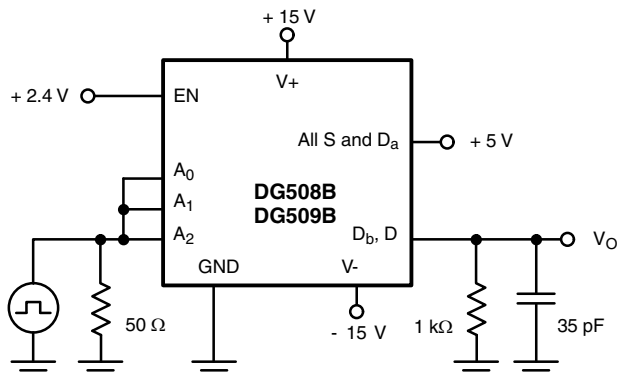


Fig. 4 - Break-Before-Make Interval

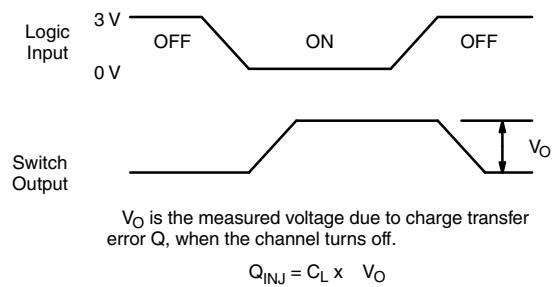
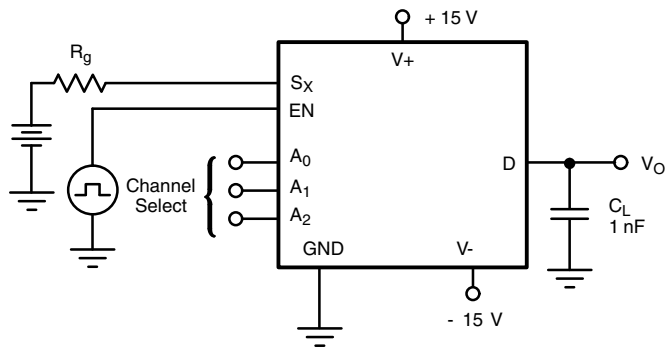


Fig. 5 - Charge Injection

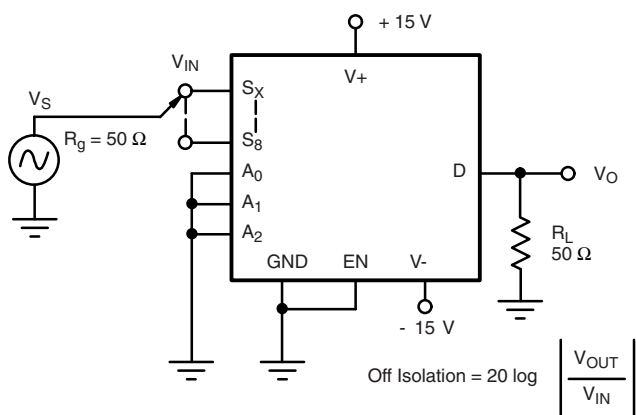


Fig. 6 - Off Isolation

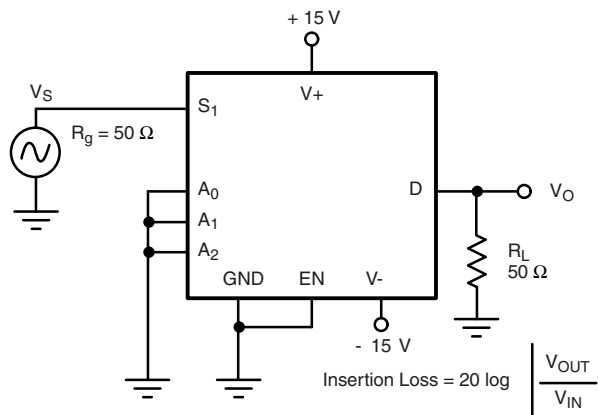
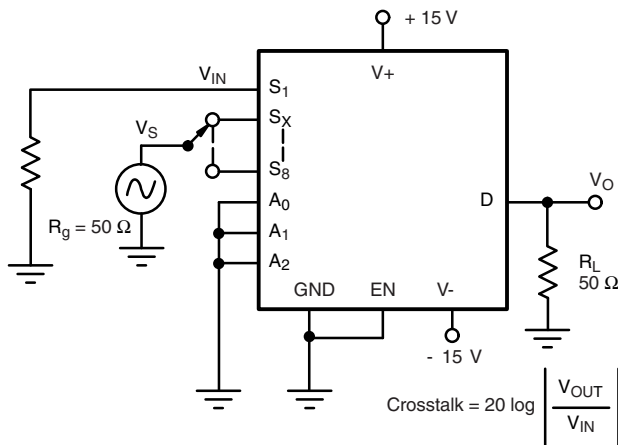
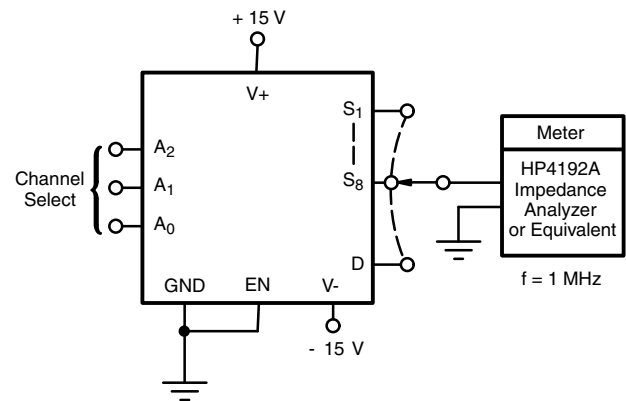
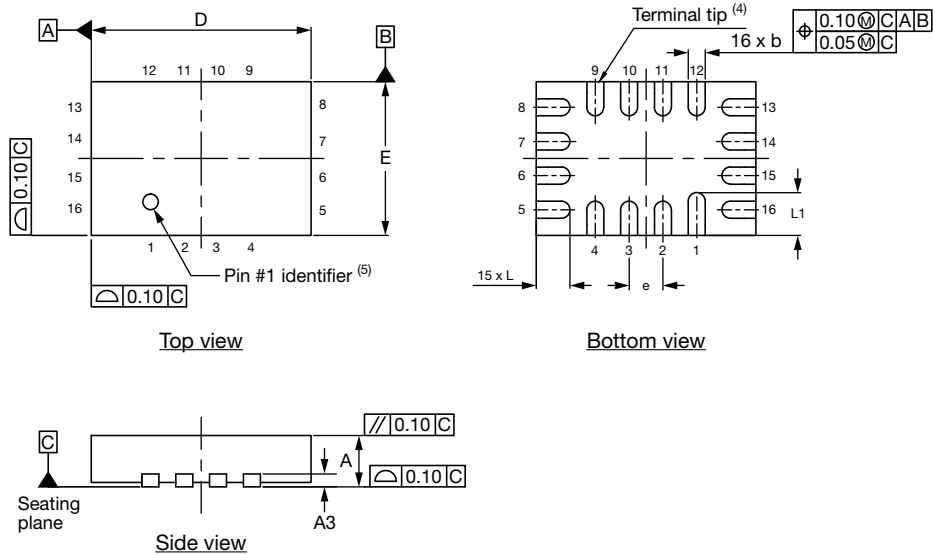


Fig. 7 - Insertion Loss

**TEST CIRCUITS**

**Fig. 8 - Crosstalk**

**Fig. 9 - Source Drain Capacitance**

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## Thin miniQFN16 Case Outline



| DIMENSIONS        | MILLIMETERS <sup>(1)</sup> |      |      | INCHES     |       |       |
|-------------------|----------------------------|------|------|------------|-------|-------|
|                   | MIN.                       | NOM. | MAX. | MIN.       | NOM.  | MAX.  |
| A                 | 0.50                       | 0.55 | 0.60 | 0.020      | 0.022 | 0.024 |
| A1                | 0                          | -    | 0.05 | 0          | -     | 0.002 |
| A3                | 0.15 ref.                  |      |      | 0.006 ref. |       |       |
| b                 | 0.15                       | 0.20 | 0.25 | 0.006      | 0.008 | 0.010 |
| D                 | 2.50                       | 2.60 | 2.70 | 0.098      | 0.102 | 0.106 |
| e                 | 0.40 BSC                   |      |      | 0.016 BSC  |       |       |
| E                 | 1.70                       | 1.80 | 1.90 | 0.067      | 0.071 | 0.075 |
| L                 | 0.35                       | 0.40 | 0.45 | 0.014      | 0.016 | 0.018 |
| L1                | 0.45                       | 0.50 | 0.55 | 0.018      | 0.020 | 0.022 |
| N <sup>(3)</sup>  | 16                         |      |      | 16         |       |       |
| Nd <sup>(3)</sup> | 4                          |      |      | 4          |       |       |
| Ne <sup>(3)</sup> | 4                          |      |      | 4          |       |       |

### Notes

- (1) Use millimeters as the primary measurement.
- (2) Dimensioning and tolerances conform to ASME Y14.5M. - 1994.
- (3) N is the number of terminals. Nd and Ne is the number of terminals in each D and E site respectively.
- (4) Dimensions b applies to plated terminal and is measured between 0.15 mm and 0.30 mm from terminal tip.
- (5) The pin 1 identifier must be existed on the top surface of the package by using identification mark or other feature of package body.
- (6) Package warpage max. 0.05 mm.

ECN: T16-0226-Rev. B, 09-May-16  
DWG: 6023



**SOIC (NARROW): 16-LEAD**  
JEDEC Part Number: MS-012

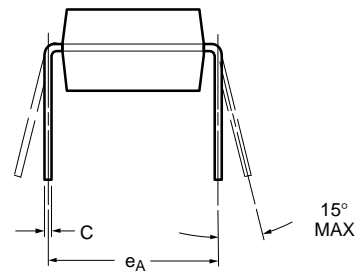
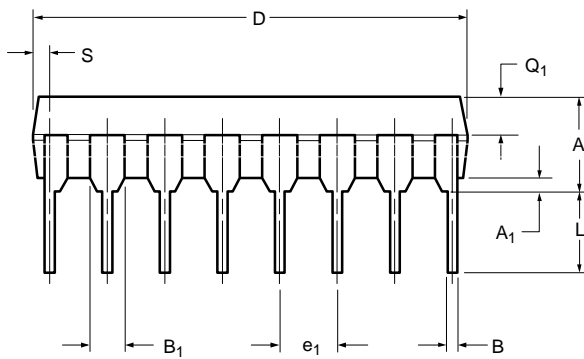
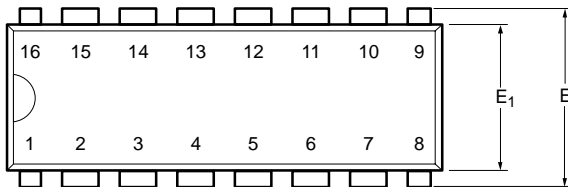


| Dim            | MILLIMETERS |       | INCHES    |       |
|----------------|-------------|-------|-----------|-------|
|                | Min         | Max   | Min       | Max   |
| A              | 1.35        | 1.75  | 0.053     | 0.069 |
| A <sub>1</sub> | 0.10        | 0.20  | 0.004     | 0.008 |
| B              | 0.38        | 0.51  | 0.015     | 0.020 |
| C              | 0.18        | 0.23  | 0.007     | 0.009 |
| D              | 9.80        | 10.00 | 0.385     | 0.393 |
| E              | 3.80        | 4.00  | 0.149     | 0.157 |
| e              | 1.27 BSC    |       | 0.050 BSC |       |
| H              | 5.80        | 6.20  | 0.228     | 0.244 |
| L              | 0.50        | 0.93  | 0.020     | 0.037 |
| ∅              | 0°          | 8°    | 0°        | 8°    |

ECN: S-03946—Rev. F, 09-Jul-01  
DWG: 5300



### PDIP: 16-LEAD

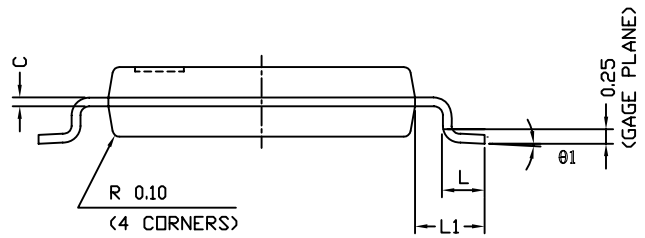
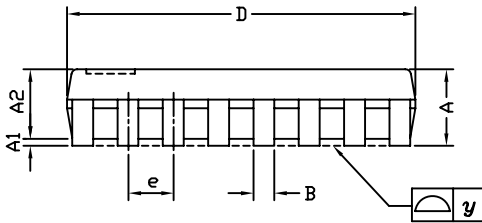


| Dim                  | MILLIMETERS |       | INCHES |       |
|----------------------|-------------|-------|--------|-------|
|                      | Min         | Max   | Min    | Max   |
| <b>A</b>             | 3.81        | 5.08  | 0.150  | 0.200 |
| <b>A<sub>1</sub></b> | 0.38        | 1.27  | 0.015  | 0.050 |
| <b>B</b>             | 0.38        | 0.51  | 0.015  | 0.020 |
| <b>B<sub>1</sub></b> | 0.89        | 1.65  | 0.035  | 0.065 |
| <b>C</b>             | 0.20        | 0.30  | 0.008  | 0.012 |
| <b>D</b>             | 18.93       | 21.33 | 0.745  | 0.840 |
| <b>E</b>             | 7.62        | 8.26  | 0.300  | 0.325 |
| <b>E<sub>1</sub></b> | 5.59        | 7.11  | 0.220  | 0.280 |
| <b>e<sub>1</sub></b> | 2.29        | 2.79  | 0.090  | 0.110 |
| <b>e<sub>A</sub></b> | 7.37        | 7.87  | 0.290  | 0.310 |
| <b>L</b>             | 2.79        | 3.81  | 0.110  | 0.150 |
| <b>Q<sub>1</sub></b> | 1.27        | 2.03  | 0.050  | 0.080 |
| <b>S</b>             | 0.38        | 1.52  | .015   | 0.060 |

ECN: S-03946—Rev. D, 09-Jul-01  
DWG: 5482



## TSSOP: 16-LEAD



| Symbols | DIMENSIONS IN MILLIMETERS |       |      |
|---------|---------------------------|-------|------|
|         | Min                       | Nom   | Max  |
| A       | -                         | 1.10  | 1.20 |
| A1      | 0.05                      | 0.10  | 0.15 |
| A2      | -                         | 1.00  | 1.05 |
| B       | 0.22                      | 0.28  | 0.38 |
| C       | -                         | 0.127 | -    |
| D       | 4.90                      | 5.00  | 5.10 |
| E       | 6.10                      | 6.40  | 6.70 |
| E1      | 4.30                      | 4.40  | 4.50 |
| e       | -                         | 0.65  | -    |
| L       | 0.50                      | 0.60  | 0.70 |
| L1      | 0.90                      | 1.00  | 1.10 |
| y       | -                         | -     | 0.10 |
| θ1      | 0°                        | 3°    | 6°   |

ECN: S-61920-Rev. D, 23-Oct-06  
DWG: 5624



**RECOMMENDED MINIMUM PAD FOR TSSOP-16**



Recommended Minimum Pads  
Dimensions in inches (mm)

## RECOMMENDED MINIMUM PADS FOR MINI QFN 16L



Mounting Footprint  
Dimensions in mm (inch)

## RECOMMENDED MINIMUM PADS FOR SO-16



Recommended Minimum Pads  
Dimensions in Inches/(mm)

[Return to Index](#)



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