# 3.2 Ω, Fast Switching Speed, +12 V / +5 V / +3 V / ± 5 V, 4- / 8-Channel Analog Multiplexers

## DESCRIPTION

The DG9408E, DG9409E uses BiCMOS wafer fabrication technology that allows the DG9408E, DG9409E to operate on single and dual supplies. Single supply voltage ranges from 3 V to 16 V while dual supply operation is recommended with ± 3 V to ± 8 V.

The DG9408E 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 ($A_0$, $A_1$, $A_2$). The DG9409E 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 ($A_0$, $A_1$). Break-before-make switching action to protect against momentary crosstalk between adjacent channels.

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with lead (Pb)-free device terminations. The DG9408E, DG9409E are offered in a QFN package that has a nickel-palladium-gold device terminations and is represented by the lead (Pb)-free "-E4" suffix. The nickel-palladium-gold device terminations meet all the JEDEC® standards for reflow and MSL ratings.

## FEATURES

- 3 V to 16 V single supply or ± 3 V to ± 8 V dual supply operation
- Low on-resistance - $R_{ON}$: 3.2 Ω typ.
- Fast switching: $t_{ON}$ - 36 ns, $t_{OFF}$ - 24 ns
- Break-before-make guaranteed
- Low leakage
- TTL, CMOS, LV logic (3 V) compatible
- 2500 V ESD protection (HBM)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

HALOGEN FREE

## BENEFITS

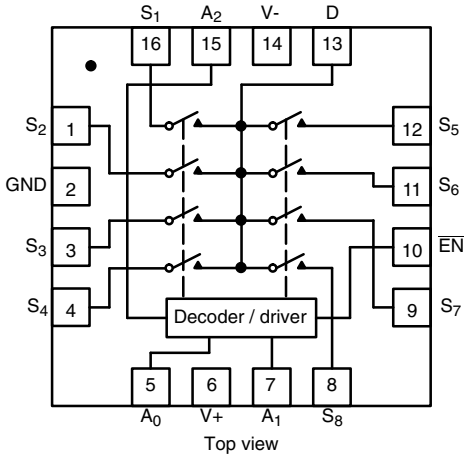
- Fast switching speed
- Low switch resistance
- Wide operation voltage range
- Simple logic interface

## APPLICATIONS

- Automatic test equipment
- Process control and automation
- Data acquisition systems
- Meters and instruments
- Medical and healthcare systems
- Communication systems
- Audio and video signal routing
- Relay replacement
- Battery powered systems

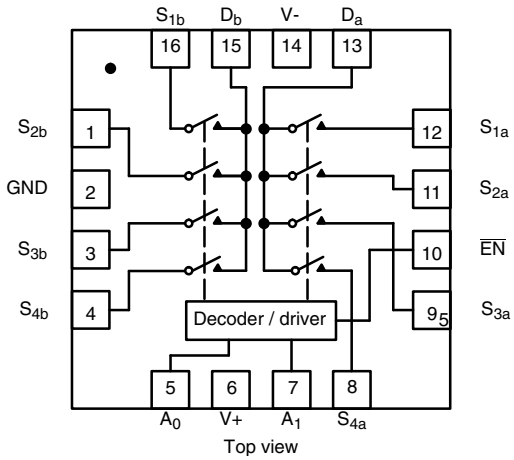
## FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

**DG9408E**
**QFN16**




Top view

**DG9409E**
**QFN16**




Top view

**Note**

- QFN16 package central exposed pad has no electrical connection inside the chip. It can be connected GND, V+, V-, or left floating.

## TRUTH TABLE AND ORDERING INFORMATION

| TRUTH TABLE DG9408E | | | | |
|---|---|---|---|---|
| $A_2$ | $A_1$ | $A_0$ | $\overline{EN}$ | ON SWITCH |
| X | X | X | 1 | None |
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 2 |
| 0 | 1 | 0 | 0 | 3 |
| 0 | 1 | 1 | 0 | 4 |
| 1 | 0 | 0 | 0 | 5 |
| 1 | 0 | 1 | 0 | 6 |
| 1 | 1 | 0 | 0 | 7 |
| 1 | 1 | 1 | 0 | 8 |

| TRUTH TABLE DG9409E | | | |
|---|---|---|---|
| $A_1$ | $A_0$ | $\overline{EN}$ | ON SWITCH |
| X | X | 1 | None |
| 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 2 |
| 1 | 0 | 0 | 3 |
| 1 | 1 | 0 | 4 |

X = do not care

For low and high voltage levels for $V_{AX}$ and $V_{\overline{EN}}$ consult “Digital Control” parameters for specific V+ operation. See specifications tables for:

Single supply 12 V

Dual supply V+ = 5 V, V- = -5 V

Single supply 5 V

Single supply 3 V

| ORDERING INFORMATION | | | |
|---|---|---|---|
| TEMP. RANGE | PACKAGE | PART NUMBER | MIN. ORDER / PACK. QUANTITY |
| -40 °C to +85 °C | 16-pin QFN (4 mm x 4 mm) (variation 1) | DG9408EDN-T1-GE4 | Tape and reel, 2500 units |
| | | DG9409EDN-T1-GE4 | Tape and reel, 2500 units |

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C, unless otherwise noted) | | | |
|---|---|---|---|
| PARAMETER | | LIMIT | UNIT |
| Voltage referenced V+ to V- | | -0.3 to +18 | V |
| GND to V- | | 18 | |
| Digital inputs [a], $V_S$, $V_D$ | | (V-) - 0.3 to (V+) + 0.3 | |
| Current (any terminal except S or D) | | 30 | mA |
| Continuous current, S or D | | 100 | |
| Peak current, S or D (pulsed at 1 ms, 10 % duty cycle max.) | | 200 | |
| Package solder reflow conditions (lead (Pb)-free assembly) [d] | 16-pin (4 x 4 mm) QFN | 260 +0 / -5 | °C |
| Storage temperature | | -65 to +150 | |
| Power dissipation (package) [b], ($T_A$ = 70 °C) | 16-pin (4 x 4 mm) QFN [c] | 1880 | mW |
| ESD human body model (HBM), per ANSI / ESDA / JEDEC® JS-001 | | 2500 | V |
| Latch up current, per JESD78 | | 400 | mA |

**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 23.5 mW/°C above 70 °C.

d. Manual soldering with soldering iron is not recommended for leadless components. The QFN 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.

*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.*

| **SPECIFICATIONS** (Single Supply 12 V) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS UNLESS OTHERWISE SPECIFIED** V+ = 12 V, ± 10 %, V- = 0 V $V_A$, $V_{\overline{EN}}$ = 0.8 V or 2.4 V [f] | | **TEMP.[b]** | **LIMITS -40 °C to +85 °C** | | | **UNIT** |
| | | | | | **MIN. [c]** | **TYP. [d]** | **MAX. [c]** | |
| **Analog Switch** | | | | | | | | |
| Analog signal range [e] | $V_{ANALOG}$ | | | Full | 0 | - | 12 | V |
| On-resistance | $R_{ON}$ | V+ = 10.8 V, $V_D$ = 2 V or 9 V, $I_S$ = 50 mA sequence each switch on | | Room | - | 3.2 | 7 | Ω |
| | | | | Full | - | | 7.5 | |
| $R_{ON}$ match between channels [g] | $\Delta R_{ON}$ | V+ = 10.8 V, $V_D$ = 2 V or 9 V, $I_S$ = 50 mA | | Room | - | - | 3.6 | |
| On-resistance flatness [i] | $R_{ON}$ flatness | | | Room | - | - | 8 | |
| Switch off leakage current | $I_{S(off)}$ | $V_{\overline{EN}}$ = 2.4 V, $V_D$ = 11 V or 1 V, $V_S$ = 1 V or 11 V | | Room | -2 | - | 2 | nA |
| | | | | Full | -15 | - | 15 | |
| | $I_{D(off)}$ | | | Room | -2 | - | 2 | |
| | | | | Full | -15 | - | 15 | |
| Channel on leakage current | $I_{D(on)}$ | $V_{\overline{EN}}$ = 0 V, $V_S$ = $V_D$ = 1 V or 11 V | | Room | -2 | - | 2 | |
| | | | | Full | -15 | - | 15 | |
| **Digital Control** | | | | | | | | |
| Logic high input voltage | $V_{INH}$ | | | Full | 2.4 | - | - | V |
| Logic low input voltage | $V_{INL}$ | | | Full | - | - | 0.8 | |
| Input current | $I_{IN}$ | $V_{AX}$ = $V_{\overline{EN}}$ = 2.4 V or 0.8 V | | Full | -1 | - | 1 | µA |
| **Dynamic Characteristics** | | | | | | | | |
| Transition time | $t_{TRANS}$ | $V_{S1}$ = 8 V, $V_{S8}$ = 0 V, (DG9408E) $V_{S1b}$ = 8 V, $V_{S4b}$ = 0 V, (DG9409E) see fig. 2 | | Room | - | 40 | 71 | ns |
| | | | | Full | - | - | 75 | |
| Break-before-make time | $t_{BBM}$ | $V_{S(all)}$ = $V_{DA}$ = 5 V see fig. 4 | | Room | 2 | 20 | - | |
| | | | | Full | - | - | - | |
| Enable turn-on time | $t_{ON(\overline{EN})}$ | $V_{AX}$ = 0 V, $V_{S1}$ = 5 V (DG9408E) $V_{AX}$ = 0 V, $V_{S1b}$ = 5 V (DG9409E) see fig. 3 | | Room | - | 36 | 70 | |
| | | | | Full | - | - | 75 | |
| Enable turn-off time | $t_{OFF(\overline{EN})}$ | | | Room | - | 24 | 44 | |
| | | | | Full | - | - | 46 | |
| Charge injection [e] | Q | $C_L$ = 1 nF, $V_{GEN}$ = 0 V, $R_{GEN}$ = 0 Ω | | Room | - | 4.5 | - | pC |
| Off isolation [e, h] | OIRR | f = 100 kHz, $R_L$ = 1 kΩ | | Room | - | -83 | - | dB |
| Crosstalk [e] | $X_{TALK}$ | | | Room | - | -89 | - | |
| Source off capacitance [e] | $C_{S(off)}$ | f = 1 MHz, $V_S$ = 0 V, $V_{\overline{EN}}$ = 2.4 V | DG9408E | Room | - | 17 | - | pF |
| | | | DG9409E | Room | - | 16 | - | |
| Drain off capacitance [e] | $C_{D(off)}$ | f = 1 MHz, $V_D$ = 0 V, $V_{\overline{EN}}$ = 2.4 V | DG9408E | Room | - | 134 | - | |
| | | | DG9409E | Room | - | 67 | - | |
| Drain on capacitance [e] | $C_{D(on)}$ | f = 1 MHz, $V_D$ = 0 V, $V_{\overline{EN}}$ = 0 V | DG9408E | Room | - | 154 | - | |
| | | | DG9409E | Room | - | 86 | - | |
| **Power Supplies** | | | | | | | | |
| Power supply current | I+ | $V_{\overline{EN}}$ = $V_A$ = 0 V or V+ | | Room | - | - | 1 | µA |

| **SPECIFICATIONS** (Dual Supply V+ = 5 V, V- = -5 V) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS UNLESS OTHERWISE SPECIFIED** V+ = 5 V, V- = -5 V, ± 10 % $V_A$, $V_{\overline{EN}}$ = 0.8 V or 2 V [f] | | **TEMP.** [b] | **LIMITS -40 °C to +85 °C** | | | **UNIT** |
| | | | | | **MIN.** [c] | **TYP.** [d] | **MAX.** [c] | |
| **Analog Switch** | | | | | | | | |
| Analog signal range [e] | $V_{ANALOG}$ | | | Full | -5 | - | 5 | V |
| On-Resistance | $R_{ON}$ | V+ = 4.5 V, V- = -4.5 V, $V_D$ = ± 3.5 V, $I_S$ = 50 mA sequence each switch on | | Room | - | 4 | 8 | Ω |
| | | | | Full | - | - | 8.5 | |
| $R_{ON}$ match between channels [g] | $\Delta R_{ON}$ | V+ = 4.5 V, V- = -4.5 V, $V_D$ = ± 3.5 V, $I_S$ = 50 mA | | Room | - | - | 3.6 | |
| On-resistance flatness [i] | $R_{ON}$ Flatness | | | Room | - | - | 8.2 | |
| Switch off leakage current [a] | $I_{S(off)}$ | V+ = 5.5, V- = -5.5 V $V_{\overline{EN}}$ = 2.4 V, $V_D$ = ± 4.5 V, $V_S$ = ± 4.5 V | | Room | -2 | - | 2 | nA |
| | | | | Full | -15 | - | 15 | |
| | $I_{D(off)}$ | | | Room | -2 | - | 2 | |
| | | | | Full | -15 | - | 15 | |
| Channel on leakage current [a] | $I_{D(on)}$ | V+ = 5.5 V, V- = -5.5 V $V_{\overline{EN}}$ = 0 V, $V_D$ = ± 4.5 V, $V_S$ = ± 4.5 V | | Room | -2 | - | 2 | |
| | | | | Full | -15 | - | 15 | |
| **Digital Control** | | | | | | | | |
| Logic high input voltage | $V_{INH}$ | | | Full | 2 | - | - | V |
| Logic low input voltage | $V_{INL}$ | | | Full | - | - | 0.8 | |
| Input current [a] | $I_{IN}$ | $V_{AX}$ = $V_{\overline{EN}}$ = 2 V or 0.8 V | | Full | -1 | - | 1 | µA |
| **Dynamic Characteristics** | | | | | | | | |
| Transition time [e] | $t_{TRANS}$ | $V_{S1}$ = 3.5 V, $V_{S8}$ = -3.5 V, (DG9408E) $V_{S1b}$ = 3.5 V, $V_{S4b}$ = -3.5 V, (DG9409E) see fig. 2 | | Room | - | 47 | 65 | ns |
| | | | | Full | - | - | 70 | |
| Break-before-make time [e] | $t_{BBM}$ | $V_{S(all)}$ = $V_{DA}$ = 3.5 V see fig. 4 | | Room | 1 | 13 | - | |
| | | | | Full | - | - | - | |
| Enable turn-on time [e] | $t_{ON(\overline{EN})}$ | $V_{AX}$ = 0 V, $V_{S1}$ = 3.5 V (DG9408E) $V_{AX}$ = 0 V, $V_{S1b}$ = 3.5 V (DG9409E) see fig. 3 | | Room | - | 54 | 70 | |
| | | | | Full | - | - | 76 | |
| Enable turn-off time [e] | $t_{OFF(\overline{EN})}$ | | | Room | - | 28 | 40 | |
| | | | | Full | - | - | 43 | |
| Source off capacitance [e] | $C_{S(off)}$ | f = 1 MHz, $V_S$ = 0 V, $V_{\overline{EN}}$ = 2 V | DG9408E | Room | - | 15 | - | pF |
| | | | DG9409E | Room | - | 14 | - | |
| Drain off capacitance [e] | $C_{D(off)}$ | f = 1 MHz, $V_D$ = 0 V, $V_{\overline{EN}}$ = 2 V | DG9408E | Room | - | 126 | - | |
| | | | DG9409E | Room | - | 63 | - | |
| Drain on capacitance [e] | $C_{D(on)}$ | f = 1 MHz, $V_D$ = 0 V, $V_{\overline{EN}}$ = 0 V | DG9408E | Room | - | 153 | - | |
| | | | DG9409E | Room | - | 89 | - | |
| **Power Supplies** | | | | | | | | |
| Power supply current | I+ | $V_{\overline{EN}}$ = VA = 0 V or V+ | | Room | - | - | 1 | µA |
| | I- | | | Room | -1 | - | - | |

| **SPECIFICATIONS** (Single Supply 5 V) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS UNLESS OTHERWISE SPECIFIED** V+ = 5 V, ± 10 %, V- = 0 V $V_A$, $V_{\overline{EN}}$ = 0.8 V or 2 V [f] | | **TEMP.** [b] | **LIMITS -40 °C to +85 °C** | | | **UNIT** |
| | | | | | **MIN.** [c] | **TYP.** [d] | **MAX.** [c] | |
| **Analog Switch** | | | | | | | | |
| Analog signal range [e] | $V_{ANALOG}$ | | | Full | 0 | - | 5 | V |
| On-resistance | $R_{ON}$ | V+ = 4.5 V, $V_D$ or $V_S$ = 1 V or 3.5 V, $I_S$ = 50 mA | | Room | - | 6.8 | 10.5 | Ω |
| | | | | Full | - | - | 11 | |
| $R_{ON}$ match between channels [g] | $\Delta R_{ON}$ | V+ = 4.5 V, $V_D$ = 1 V or 3.5 V, $I_S$ = 50 mA | | Room | - | - | 3.6 | |
| On-resistance flatness [i] | $R_{ON}$ Flatness | | | Room | - | - | 9 | |
| Switch off leakage current [a] | $I_{S(off)}$ | V+ = 5.5 V $V_S$ = 1 V or 4 V, $V_D$ = 4 V or 1 V | | Room | -2 | - | 2 | nA |
| | | | | Full | -15 | - | 15 | |
| | $I_{D(off)}$ | | | Room | -2 | - | 2 | |
| | | | | Full | -15 | - | 15 | |
| Channel on leakage current [a] | $I_{D(on)}$ | V+ = 5.5 V $V_D$ = $V_S$ = 1 V or 4 V, sequence each switch on | | Room | -2 | - | 2 | |
| | | | | Full | -15 | - | 15 | |
| **Digital Control** | | | | | | | | |
| Logic high input voltage | $V_{INH}$ | V+ = 5 V | | Full | 2 | - | - | V |
| Logic low input voltage | $V_{INL}$ | | | Full | - | - | 0.8 | |
| Input current [a] | $I_{IN}$ | $V_{AX}$ = $V_{\overline{EN}}$ = 2 V or 0.8 V | | Full | -1 | - | 1 | µA |
| **Dynamic Characteristics** | | | | | | | | |
| Transition time [e] | $t_{TRANS}$ | $V_{S1}$ = 3.5 V, $V_{S8}$ = 0 V, (DG9408E) $V_{S1b}$ = 3.5 V, $V_{S4b}$ = 0 V, (DG9409E) see fig. 2 | | Room | - | 79 | 97 | ns |
| | | | | Full | - | - | 112 | |
| Break-before-make time [e] | $t_{OPEN}$ | $V_{S(all)}$ = $V_{DA}$ = 3.5 V see fig. 4 | | Room | 2 | 35 | - | |
| | | | | Full | - | - | - | |
| Enable turn-on time [e] | $t_{ON(\overline{EN})}$ | $V_{AX}$ = 0 V, $V_{S1}$ = 3.5 V (DG9408E) $V_{AX}$ = 0 V, $V_{S1b}$ = 3.5 V (DG9409E) see fig. 3 | | Room | - | 83 | 95 | |
| | | | | Full | - | - | 116 | |
| Enable turn-off time [e] | $t_{OFF(\overline{EN})}$ | | | Room | - | 36 | 57 | |
| | | | | Full | - | - | 61 | |
| Charge injection [e] | Q | $C_L$ = 1 nF, $R_{GEN}$ = 0, $V_{GEN}$ = 0 V | | Room | - | 3.7 | - | pC |
| Off isolation [e, h] | OIRR | $R_L$ = 1 kΩ, f = 100 kHz | | Room | - | -83 | - | dB |
| Crosstalk [e] | $X_{TALK}$ | | | Room | - | -90 | - | |
| Source off capacitance [e] | $C_{S(off)}$ | f = 1 MHz, $V_S$ = 0 V, $V_{\overline{EN}}$ = 0 V | DG9408E | Room | - | 19 | - | pF |
| | | | DG9409E | Room | - | 18 | - | |
| Drain off capacitance [e] | $C_{D(off)}$ | f = 1 MHz, $V_D$ = 0 V, $V_{\overline{EN}}$ = 2 V | DG9408E | Room | - | 149 | - | |
| | | | DG9409E | Room | - | 74 | - | |
| Drain on capacitance [e] | $C_{D(on)}$ | f = 1 MHz, $V_D$ = 0 V, $V_{\overline{EN}}$ = 0 V | DG9408E | Room | - | 170 | - | |
| | | | DG9409E | Room | - | 94 | - | |
| **Power Supplies** | | | | | | | | |
| Power supply current | I+ | $V_{\overline{EN}}$ = $V_A$ = 0 V or V+ | | Room | - | - | 1 | µA |

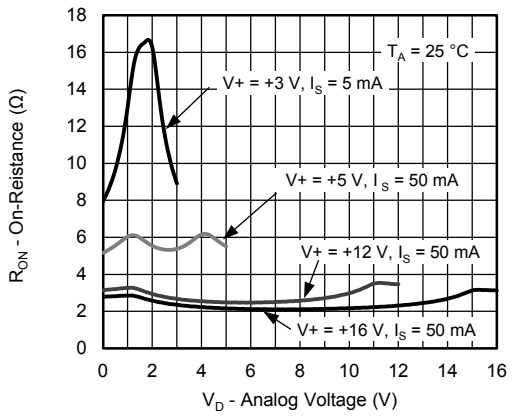
## SPECIFICATIONS (Single Supply 3 V)

| PARAMETER | SYMBOL | TEST CONDITIONS UNLESS OTHERWISE SPECIFIED V+ = 3 V, ± 10 %, V- = 0 V $V_{\overline{EN}}$ = 0.4 V or 1.8 V [f] | | TEMP. [b] | LIMITS -40 °C to +85 °C MIN. [c] | TYP. [d] | MAX. [c] | UNIT |
|---|---|---|---|---|---|---|---|---|
| **Analog Switch** | | | | | | | | |
| Analog signal range [e] | $V_{ANALOG}$ | | | Full | 0 | - | 3 | V |
| On-resistance | $R_{ON}$ | V+ = 2.7 V, $V_D$ = 0.5 V or 2.2 V, $I_S$ = 5 mA | | Room | - | 13 | 25.5 | Ω |
| | | | | Full | - | - | 26.5 | |
| $R_{ON}$ match between channels [g] | $\Delta R_{ON}$ | V+ = 2.7 V, $V_D$ = 0.5 V or 2.2 V, $I_S$ = 5 mA | | Room | - | - | 3.6 | |
| On-resistance flatness [i] | $R_{ON}$ Flatness | | | Room | - | - | 13 | |
| Switch off leakage current [a] | $I_{S(off)}$ | V+ = 3.3 V $V_S$ = 2 V or 1 V, $V_D$ = 1 or 2 V | | Room | -2 | - | 2 | nA |
| | | | | Full | -15 | - | 15 | |
| | $I_{D(off)}$ | | | Room | -2 | - | 2 | |
| | | | | Full | -15 | - | 15 | |
| Channel on leakage current [a] | $I_{D(on)}$ | V+ = 3.3 V $V_D$ = $V_S$ = 1 V or 2 V, sequence each switch on | | Room | -2 | - | 2 | |
| | | | | Full | -15 | - | 15 | |
| **Digital Control** | | | | | | | | |
| Logic high input voltage | $V_{INH}$ | | | Full | 1.8 | - | - | V |
| Logic low input voltage | $V_{INL}$ | | | Full | - | - | 0.4 | |
| Input current [a] | $I_{IN}$ | $V_{AX}$ = $V_{\overline{EN}}$ = 1.8 V or 0.4 V | | Full | -1 | - | 1 | µA |
| **Dynamic Characteristics** | | | | | | | | |
| Transition time | $t_{TRANS}$ | $V_{S1}$ = 1.5 V, $V_{S8}$ = 0 V, (DG9408E) $V_{S1b}$ = 1.5 V, $V_{S4b}$ = 0 V, (DG9409E) see fig. 2 | | Room | - | 169 | 245 | ns |
| | | | | Full | - | - | 278 | |
| Break-before-make time | $t_{BBM}$ | $V_{S(all)}$ = $V_{DA}$ = 1.5 V see fig. 4 | | Room | 2 | 96 | - | |
| | | | | Full | - | - | - | |
| Enable turn-on time | $t_{ON(\overline{EN})}$ | $V_{AX}$ = 0 V, $V_{S1}$ = 1.5 V (DG9408E) $V_{AX}$ = 0 V, $V_{S1b}$ =1.5 V (DG9409E) see fig. 3 | | Room | - | 202 | 255 | |
| | | | | Full | - | - | 272 | |
| Enable turn-off time | $t_{OFF(\overline{EN})}$ | | | Room | - | 72 | 97 | |
| | | | | Full | - | - | 104 | |
| Charge injection [e] | Q | $C_L$ = 1 nF, $R_{GEN}$ = 0, $V_{GEN}$ = 0 V | | Room | - | 2.1 | - | pC |
| Off isolation [e, h] | OIRR | f = 100 kHz, $R_L$ = 1 kΩ | | Room | - | -83 | - | dB |
| Crosstalk [e] | $X_{TALK}$ | | | Room | - | -90 | - | |
| Source off capacitance [e] | $C_{S(off)}$ | f = 1 MHz, $V_S$ = 0 V, $V_{\overline{EN}}$ = 1.8 V | DG9408E | Room | - | 20 | - | pF |
| | | | DG9409E | Room | - | 19 | - | |
| Drain off capacitance [e] | $C_{D(off)}$ | f = 1 MHz, $V_D$ = 0 V, $V_{\overline{EN}}$ = 1.8 V | DG9408E | Room | - | 159 | - | |
| | | | DG9409E | Room | - | 79 | - | |
| Drain on capacitance [e] | $C_{D(on)}$ | f = 1 MHz, $V_D$ = 0 V, $V_{\overline{EN}}$ = 0 V | DG9408E | Room | - | 179 | - | |
| | | | DG9409E | Room | - | 98 | - | |
| **Power Supplies** | | | | | | | | |
| Power supply current | I+ | $V_{\overline{EN}}$ = $V_A$ = 0 V or V+ | | Room | - | - | 1 | µA |

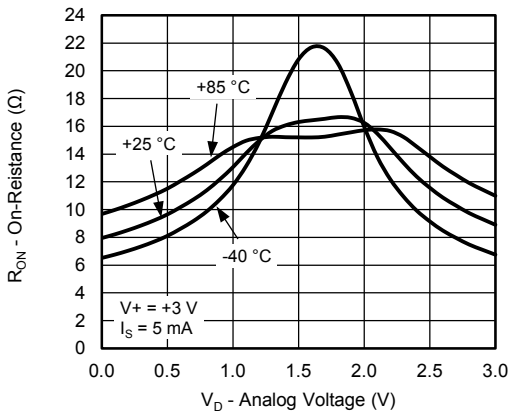
**Notes**

a. Leakage parameters are guaranteed by worst case test condition and not subject to production test.
b. Room = 25 °C, full = as determined by the operating temperature suffix.
c. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
d. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
e. Guaranteed by design, not subject to production test.
f. $V_{IN}$ = input voltage to perform proper function.
g. $\Delta R_{DON}$ = $R_{DON}$ max. - $R_{DON}$ min.
h. Worst case isolation occurs on channel 4 due to proximity to the drain pin.
i. $R_{DON}$ flatness is measured as the difference between the minimum and maximum measured values across a defined analog signal.

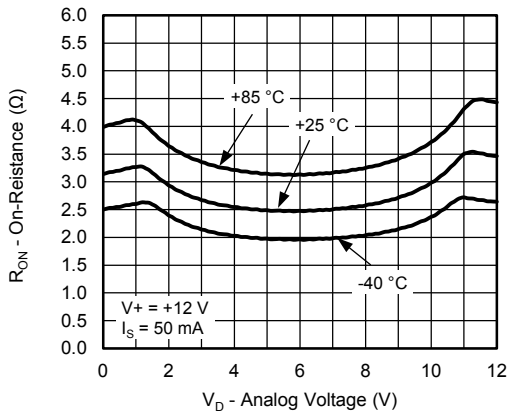
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



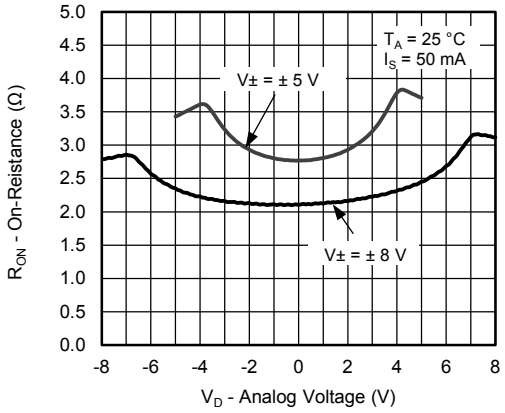

**On-Resistance vs. Analog Voltage**



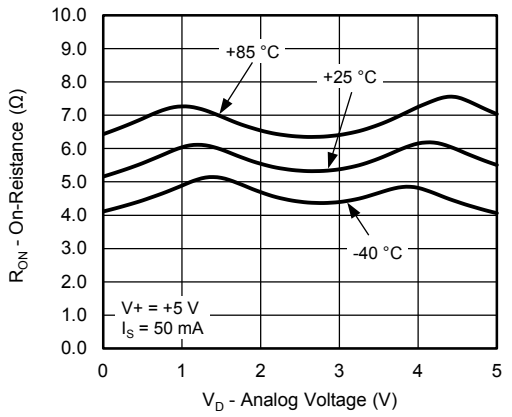

**On-Resistance vs. Analog Voltage**



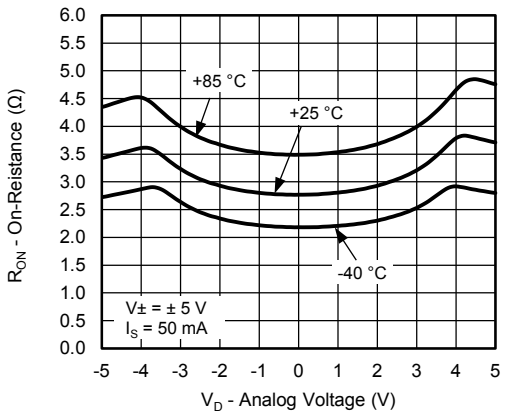

**On-Resistance vs. Analog Voltage**




**On-Resistance vs. Analog Voltage**

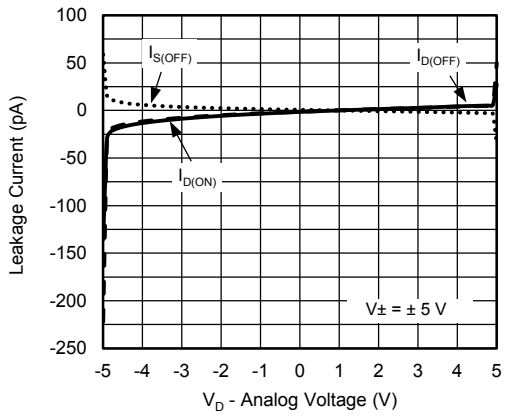



**On-Resistance vs. Analog Voltage**

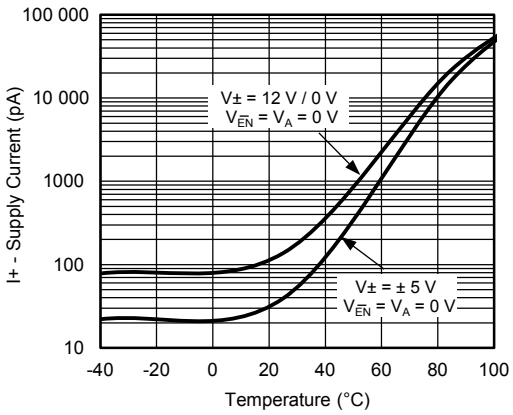



**On-Resistance vs. Analog Voltage**

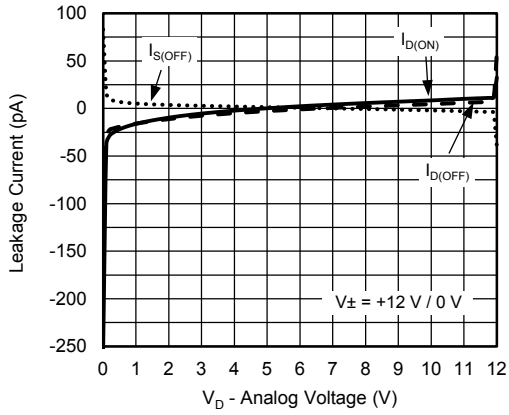
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



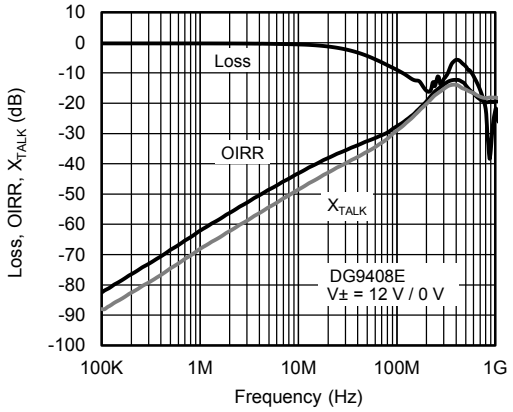

**Leakage Current vs. Analog Voltage**



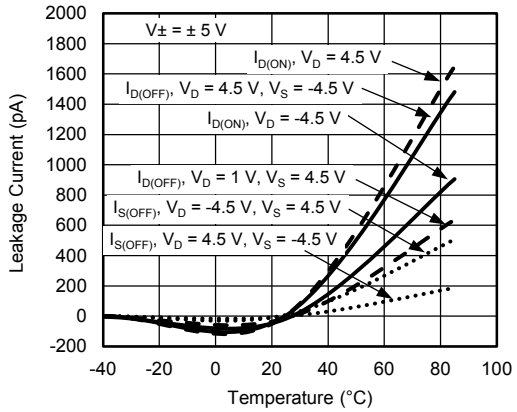

**Supply Current vs. Temperature**



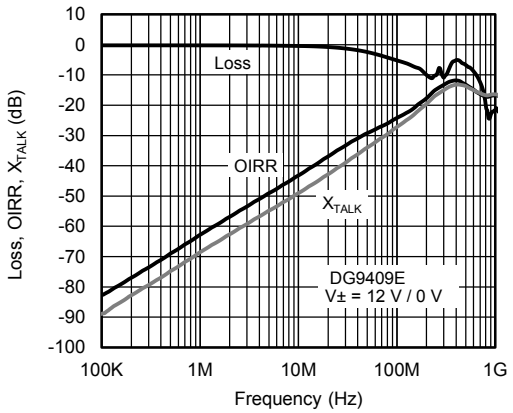

**Leakage Current vs. Analog Voltage**




**Loss, OIRR, $X_{TALK}$ vs. Frequency**

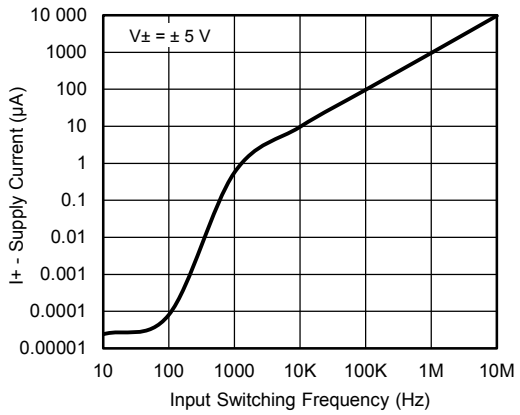



**Leakage Current vs. Temperature**

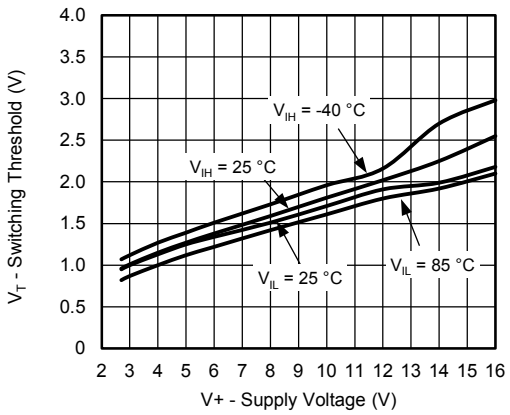



**Loss, OIRR, $X_{TALK}$ vs. Frequency**

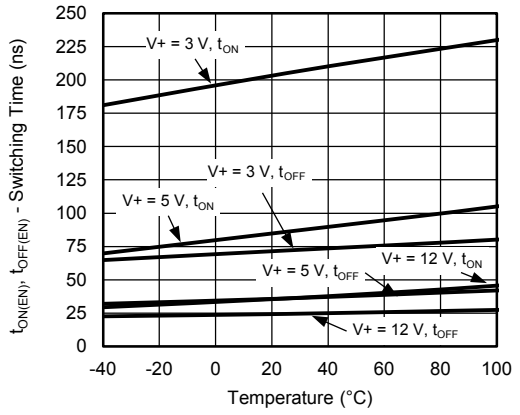
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



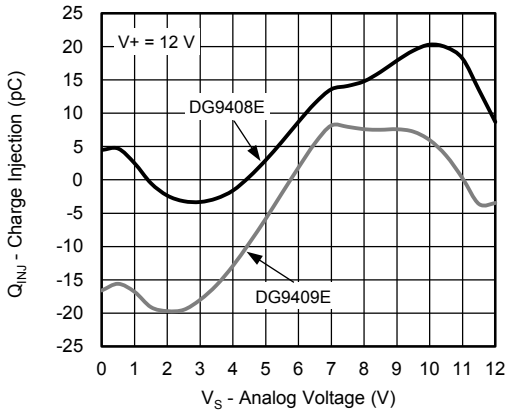

**Supply Current vs. Input Switching Frequency**



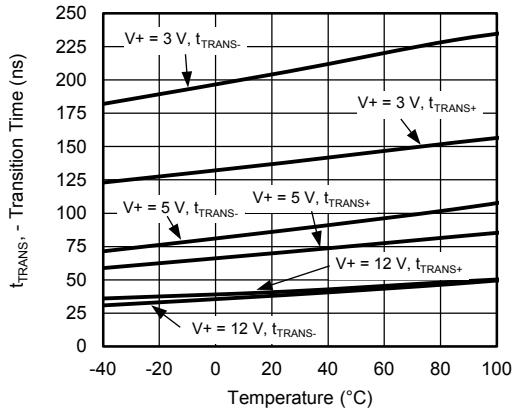

**Switching Threshold vs. Supply Voltage**



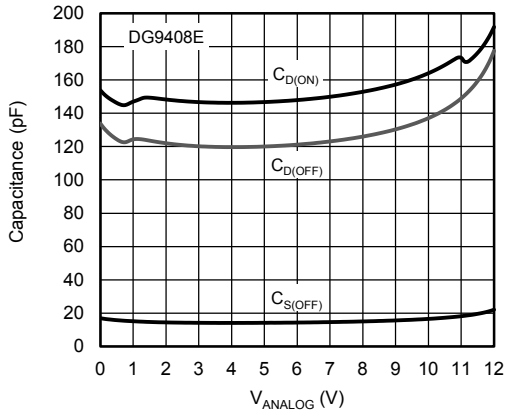

**Switching Time vs. Temperature**




**Charge Injection vs. Analog Voltage**

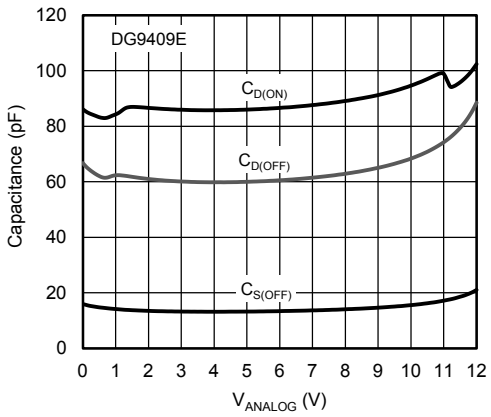



**Transition Time vs. Temperature**




**Capacitance vs. Analog Voltage**

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




**Capacitance vs. Analog Voltage**

## SCHEMATIC DIAGRAM (Typical Channel)

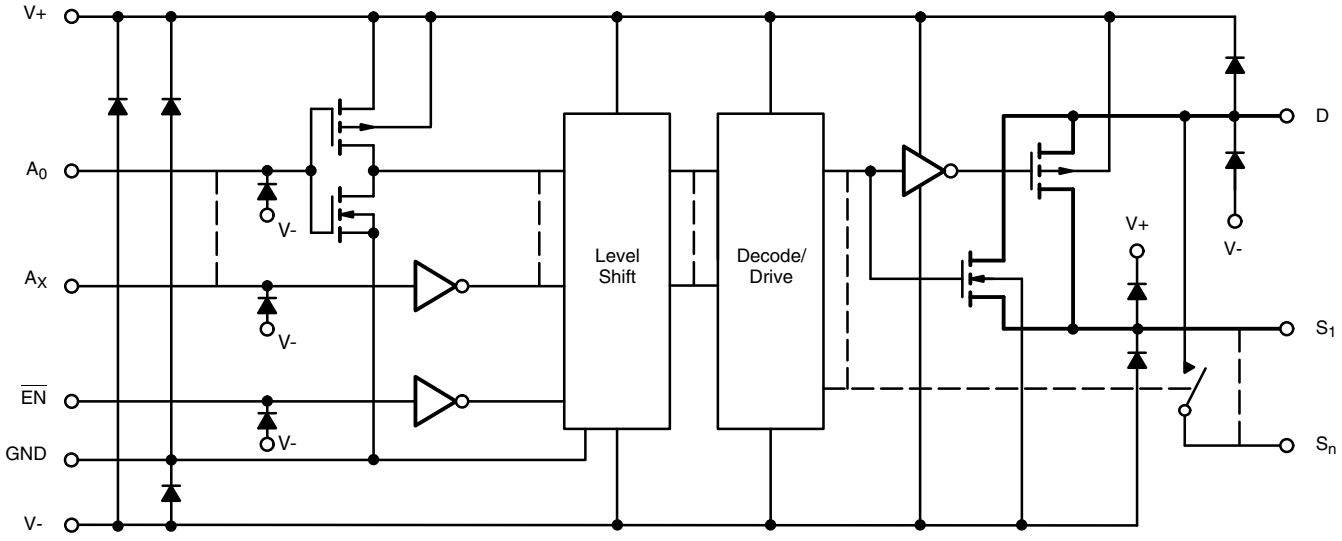
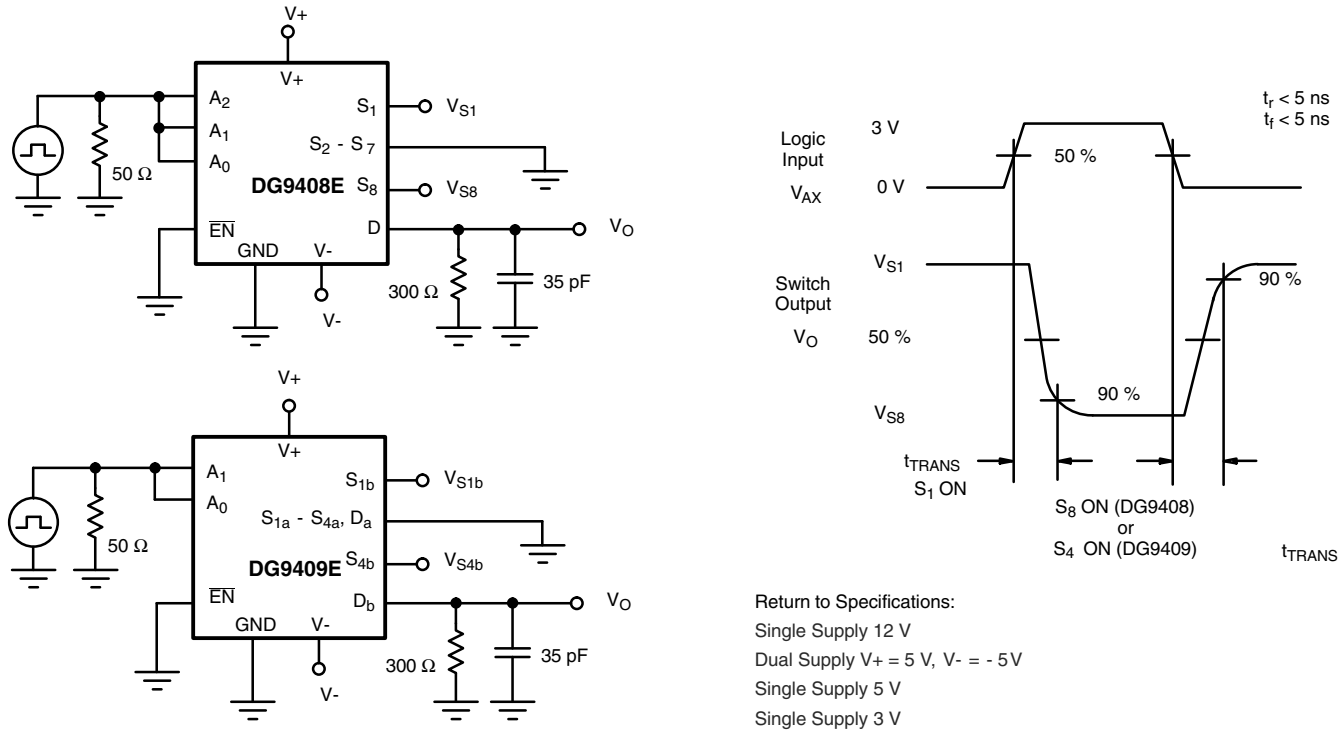


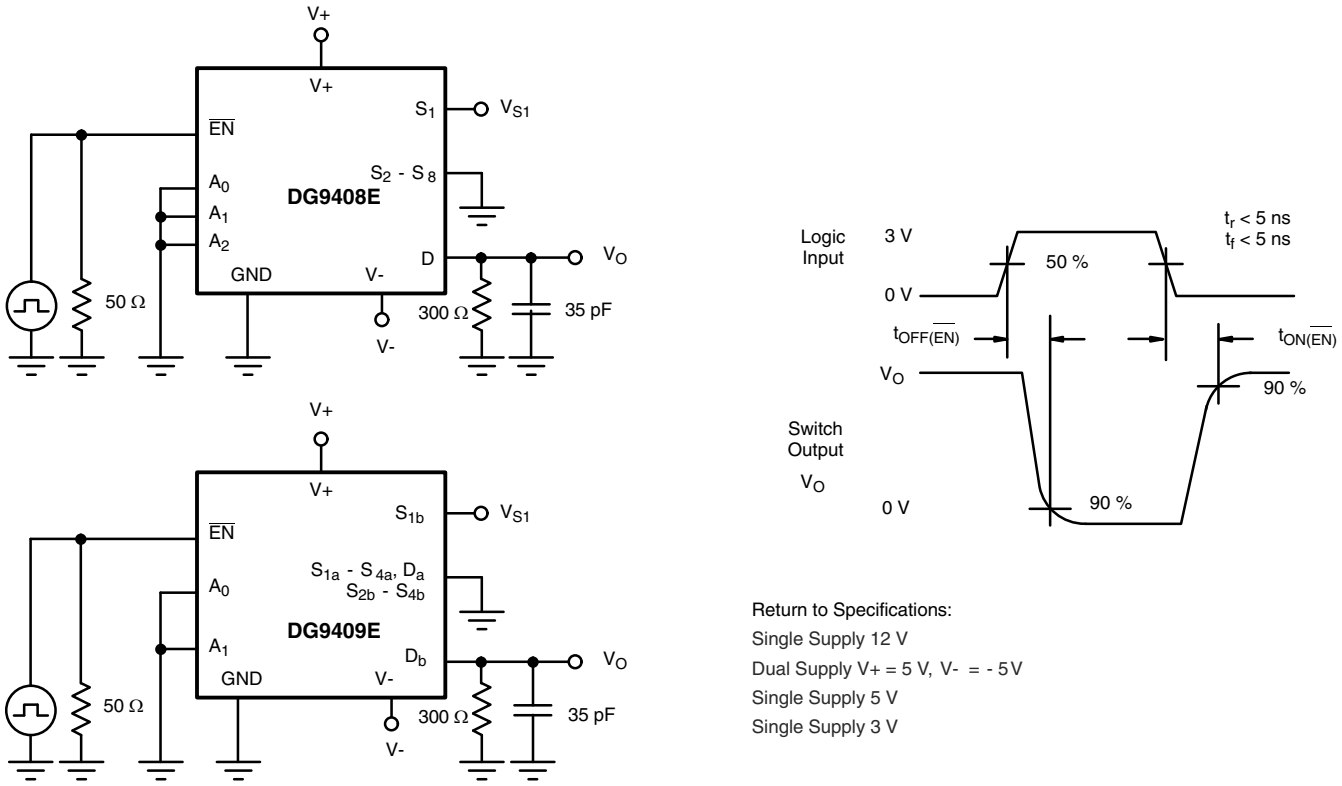

**Fig. 1 -**

## TEST CIRCUITS




Return to Specifications:
Single Supply 12 V
Dual Supply V+ = 5 V, V- = - 5 V
Single Supply 5 V
Single Supply 3 V

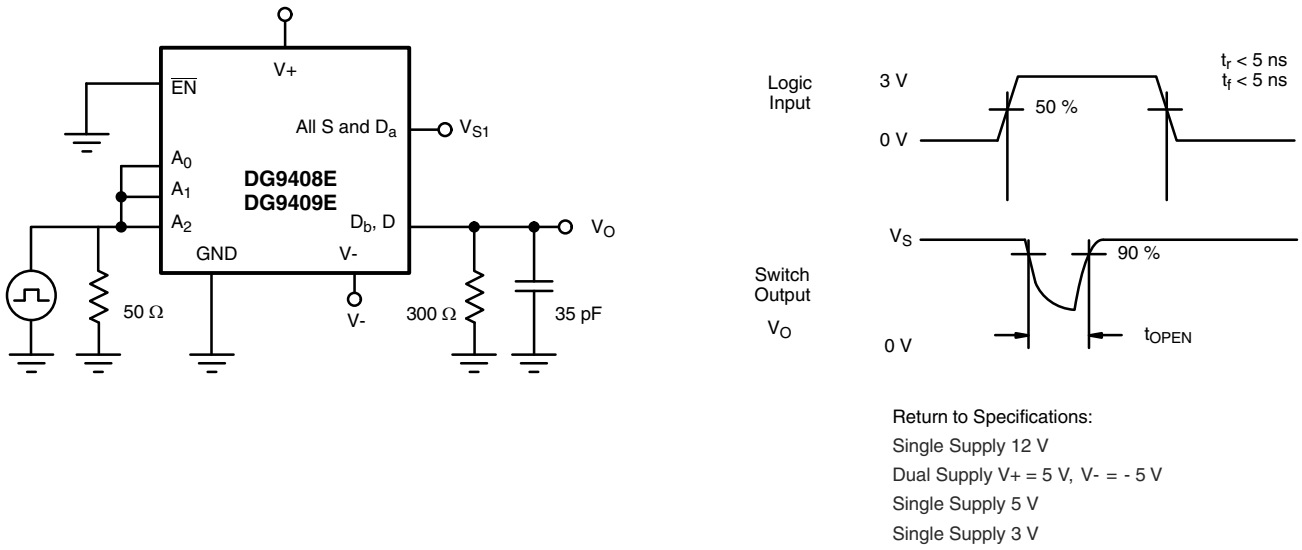
**Fig. 2 - Transition Time**




Return to Specifications:
Single Supply 12 V
Dual Supply V+ = 5 V, V- = - 5 V
Single Supply 5 V
Single Supply 3 V

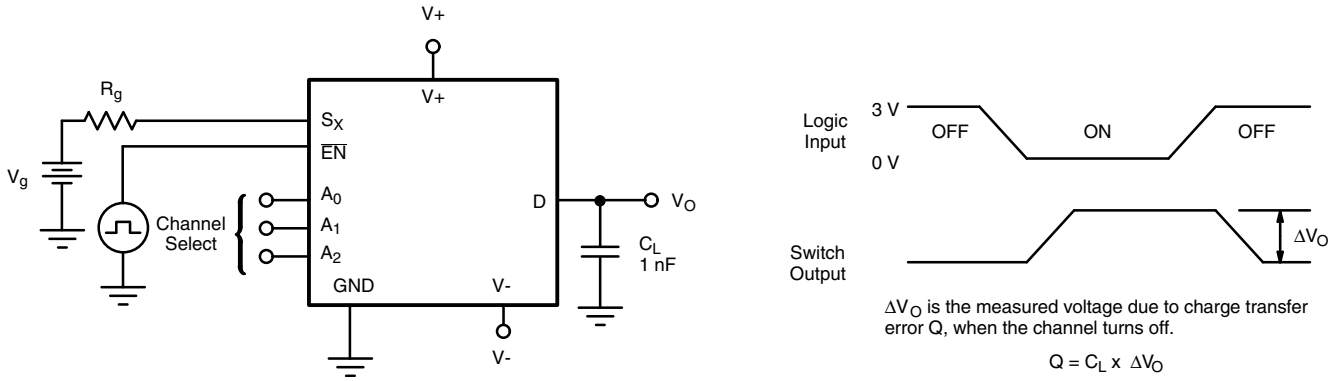
**Fig. 3 - Enable Switching Time**

## TEST CIRCUITS




Return to Specifications:
Single Supply 12 V
Dual Supply V+ = 5 V, V- = - 5 V
Single Supply 5 V
Single Supply 3 V

**Fig. 4 - Break-Before-Make Interval**




$\Delta V_O$ is the measured voltage due to charge transfer error Q, when the channel turns off.

$$Q = C_L \times \Delta V_O$$

**Fig. 5 - Charge Injection**

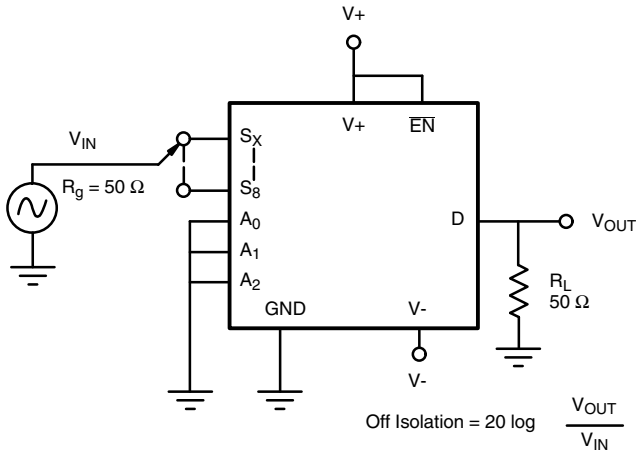



**Fig. 6 - Off Isolation**

## TEST CIRCUITS

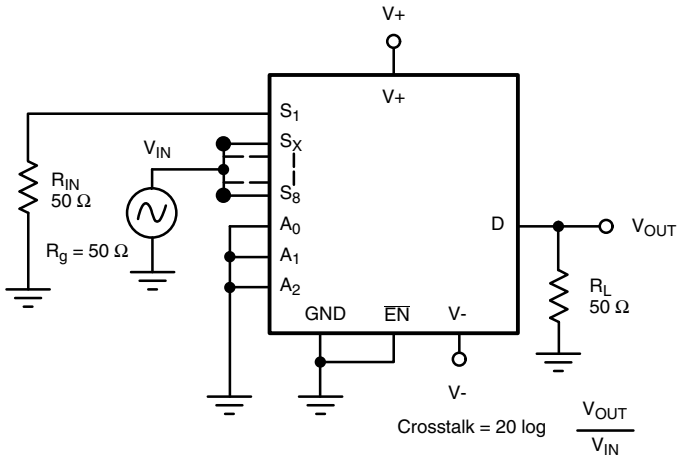



**Fig. 7 - Crosstalk**

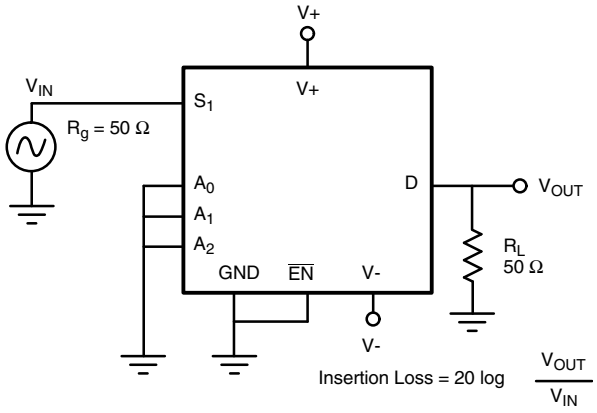



**Fig. 8 - Insertion Loss**

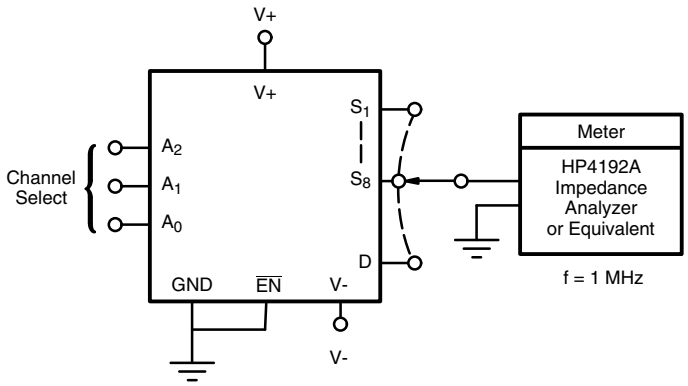
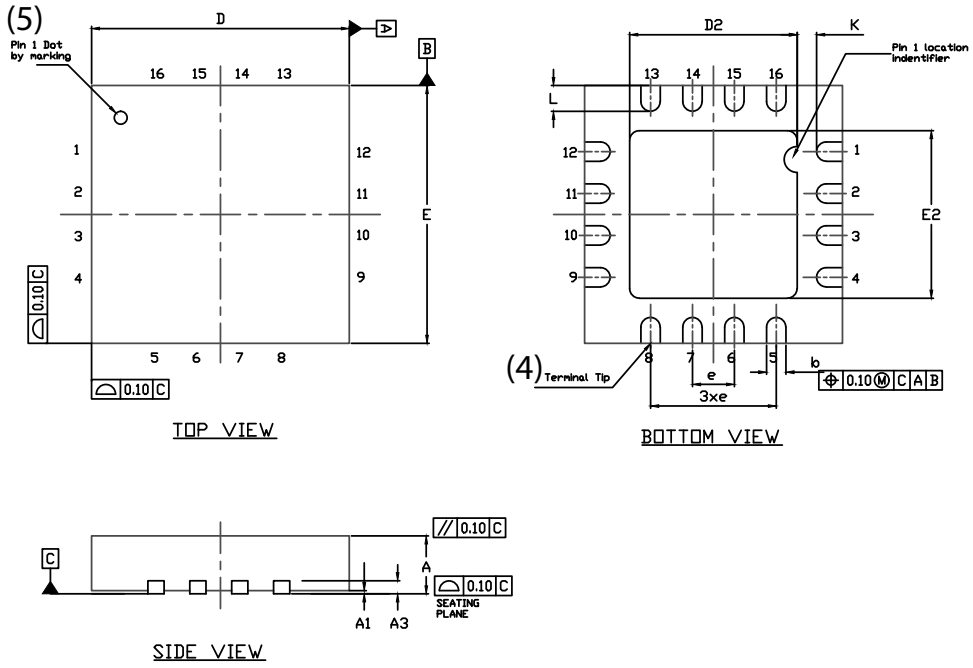



**Fig. 9 - Source Drain Capacitance**

*Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?75375.*

# QFN 4x4-16L Case Outline




| DIM | VARIATION 1 | | | | | | VARIATION 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MILLIMETERS[1] | | | INCHES | | | MILLIMETERS[1] | | | INCHES | | |
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.75 | 0.85 | 0.95 | 0.029 | 0.033 | 0.037 | 0.75 | 0.85 | 0.95 | 0.029 | 0.033 | 0.037 |
| A1 | 0 | - | 0.05 | 0 | - | 0.002 | 0 | - | 0.05 | 0 | - | 0.002 |
| A3 | 0.20 ref. | | | 0.008 ref. | | | 0.20 ref. | | | 0.008 ref. | | |
| b | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 |
| D | 4.00 BSC | | | 0.157 BSC | | | 4.00 BSC | | | 0.157 BSC | | |
| D2 | 2.0 | 2.1 | 2.2 | 0.079 | 0.083 | 0.087 | 2.5 | 2.6 | 2.7 | 0.098 | 0.102 | 0.106 |
| e | 0.65 BSC | | | 0.026 BSC | | | 0.65 BSC | | | 0.026 BSC | | |
| E | 4.00 BSC | | | 0.157 BSC | | | 4.00 BSC | | | 0.157 BSC | | |
| E2 | 2.0 | 2.1 | 2.2 | 0.079 | 0.083 | 0.087 | 2.5 | 2.6 | 2.7 | 0.098 | 0.102 | 0.106 |
| K | 0.20 min. | | | 0.008 min. | | | 0.20 min. | | | 0.008 min. | | |
| L | 0.5 | 0.6 | 0.7 | 0.020 | 0.024 | 0.028 | 0.3 | 0.4 | 0.5 | 0.012 | 0.016 | 0.020 |
| N[3] | 16 | | | 16 | | | 16 | | | 16 | | |
| Nd[3] | 4 | | | 4 | | | 4 | | | 4 | | |
| Ne[3] | 4 | | | 4 | | | 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: S13-0893-Rev. B, 22-Apr-13
DWG: 5890

# Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

# X-ON Electronics

Largest Supplier of Electrical and Electronic Components

***Click to view similar products for*** Multiplexer Switch ICs ***category:***

***Click to view products by*** Vishay ***manufacturer:***

Other Similar products are found below :

NLV74HC4066ADR2G HEF4051BP MC74HC4067ADTG DG508AAK/883B NLV14051BDG 016400E PI3V512QE 7705201EC PI2SSD3212NCE NLAS3257CMX2TCG PI3DBS12412AZLEX PI3V512QEX PI3DBS16213ZLEX PI3DBS16415ZHEX MUX36S16IRSNR 74LVC1G3157GM-Q10X TC7W53FK,LF CD4053BM96 MC74HC4053ADWR2G SN74LV4051APWR HEF4053BT.653 ADG5408BRUZ-REEL7 ADG1404YRUZ-REEL7 ADG1208YRZ-REEL7 MAX4704EUB+T ADG1406BRUZ-REEL7 LTC4305IDHD#PBF CD4053BPWRG4 74HC4053D.653 74LVC2G53DP.125 74HC4052DB.112 74HC4052PW.112 74HC4053DB.112 74HC4067DB.112 74HC4351DB.112 74HCT4052D.112 74HCT4052DB.112 74HCT4053DB.112 74HCT4067D.112 74HCT4351D.112 74LV4051PW.112 FSA1256L8X_F113 PI5V330QE PI5V331QE 5962-8771601EA 5962-87716022A ADG5249FBRUZ ADG1438BRUZ AD7506JNZ AD7506KNZ