# 8-Channel, Triple 2-Channel Multiplexers

## DESCRIPTION

The DG9451, and DG9453 are high precision single and dual supply CMOS analog multiplexers. DG9451 is an 8-channel multiplexer, and the DG9453 is a triple 2-channel multiplexer or triple SPDT.

Designed to operate from a +2.7 V to +12 V single supply or from a ± 2.5 V to ± 5 V dual supplies, the DG9451, and DG9453 are fully specified at +12 V, +5 V and ± 5 V. All control logic inputs have guaranteed 1.4 V high limit when operating from +5 V or ± 5 V supplies and 1.65 V when operating from a +12 V supply.

The DG9451, and DG9453 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 DG9451, and DG9453 operating temperature is specified from -40 °C to +85 °C and are available in 16 pin TSSOP and the ultra compact 1.8 mm x 2.6 mm miniQFN16 packages.

## FEATURES

- +2.7 V to +12 V single supply operation
  ± 2.5 V to ± 5 V dual supply operation
- Fully specified at +12 V, +5 V, ± 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)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

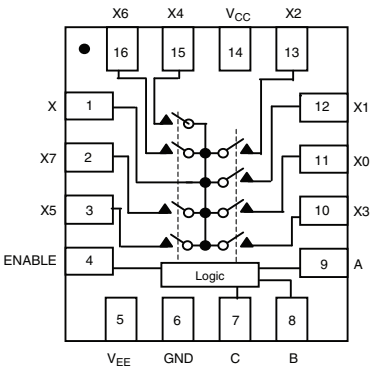
HALOGEN FREE

## APPLICATIONS

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

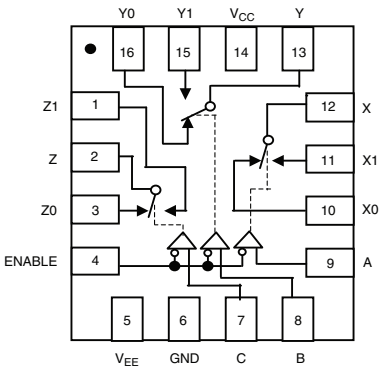
## FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

**DG9451**
mQFN-16

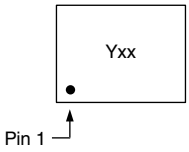



Top View

**DG9453**
mQFN-16




Top View




Device Marking: Yxx for DG9451
(miniQFN16) 4xx for DG9453

xx = Date/Lot Traceability Code



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## TRUTH TABLE

| ENABLE INPUT | SELECT INPUTS | | | ON SWITCHES | |
|---|---|---|---|---|---|
| | C | B | A | DG9451 | DG9453 |
| H | X | X | X | All Switches Open | All Switches Open |
| L | L | L | L | X to X0 | X to X0, Y to Y0, Z to Z0 |
| L | L | L | H | X to X1 | X to X1, Y to Y0, Z to Z0 |
| L | L | H | L | X to X2 | X to X0, Y to Y1, Z to Z0 |
| L | L | H | H | X to X3 | X to X1, Y to Y1, Z to Z0 |
| L | H | L | L | X to X4 | X to X0, Y to Y0, Z to Z1 |
| L | H | L | H | X to X5 | X to X1, Y to Y0, Z to Z1 |
| L | H | H | L | X to X6 | X to X0, Y to Y1, Z to Z1 |
| L | H | H | H | X to X7 | X to X1, Y to Y1, Z to Z1 |

## ORDERING INFORMATION

| TEMP. RANGE | PACKAGE | PART NUMBER |
|---|---|---|
| **DG9451, DG9453** | | |
| -40 °C to +125 °C [a] | 16-Pin miniQFN | DG9451EN-T1-E4 |
| | | DG9453EN-T1-E4 |

**Note**

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

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C, unless otherwise noted)

| PARAMETER | | LIMIT | UNIT |
|---|---|---|---|
| V+ to V- | | 14 | V |
| GND to V- | | 7 | |
| Digital Inputs [a], $V_S$, $V_D$ | | (V-) -0.3 to (V+) +0.3 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 [b] | 16-Pin miniQFN [c, d] | 525 | mW |
| Thermal Resistance [b] | 16-Pin miniQFN [d] | 152 | °C/W |
| Latch-up (per JESD78) | | > 300 | 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 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.


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## SPECIFICATIONS FOR DUAL SUPPLIES

| PARAMETER | SYMBOL | TEST CONDITIONS UNLESS OTHERWISE SPECIFIED $V_{CC}$ = +5 V, $V_{EE}$ = -5 V $V_{IN(A, B, C AND ENABLE)}$ = 1.4 V, 0.3 V [a] | | TEMP. [b] | TYP. [c] | -40 °C to +125 °C | | -40 °C to +85 °C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MIN. [d] | MAX. [d] | MIN. [d] | MAX. [d] | |
| **Analog Switch** | | | | | | | | | | |
| Analog Signal Range [e] | $V_{ANALOG}$ | | | Full | - | -5 | 5 | -5 | 5 | V |
| On-Resistance | $R_{ON}$ | $I_S$ = 1 mA, $V_D$ = -3 V, 0 V, +3 V | | Room | 66 | - | 100 | - | 100 | Ω |
| | | | | Full | - | - | 125 | - | 118 | |
| On-Resistance Match | $\Delta R_{ON}$ | $I_S$ = 1 mA, $V_D$ = ± 3 V | | Room | 3 | - | 6 | - | 6 | |
| | | | | Full | - | - | 10 | - | 8 | |
| On-Resistance Flatness | $R_{FLATNESS}$ | $I_S$ = 1 mA, $V_D$ = -3 V, 0 V, +3 V | | Room | 10.2 | - | 16 | - | 16 | |
| | | | | Full | - | - | 20 | - | 18 | |
| Switch Off Leakage Current | $I_{S(off)}$ | V+ = 5.5 V, V- = -5.5 V, $V_D$ = ± 4.5 V, $V_S$ = ∓ 4.5 V | | Room | ± 0.02 | -1 | 1 | -1 | 1 | nA |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| | $I_{D(off)}$ | | | Room | ± 0.02 | -1 | 1 | -1 | 1 | |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| Channel On Leakage Current | $I_{D(on)}$ | V+ = 5.5 V, V- = -5.5 V, $V_S$ = $V_D$ = ± 4.5 V | | Room | ± 0.02 | -1 | 1 | -1 | 1 | |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| **Digital Control** | | | | | | | | | | |
| $V_{IN(A, B, C and ENABLE)}$ Low | $V_{IL}$ | | | Full | - | - | 0.3 | - | 0.3 | V |
| $V_{IN(A, B, C and ENABLE)}$ High | $V_{IH}$ | | | Full | - | 1.4 | - | 1.4 | - | |
| Input Current, $V_{IN}$ Low | $I_{IL}$ | $V_{IN(A, B, C and ENABLE)}$ under test = 0.3 V | | Full | 0.01 | -1 | 1 | -1 | 1 | µA |
| Input Current, $V_{IN}$ High | $I_{IH}$ | $V_{IN(A, B, C and ENABLE)}$ under test = 1.4 V | | Full | 0.01 | -1 | 1 | -1 | 1 | |
| Input Capacitance [e] | $C_{IN}$ | f = 1 MHz | | Room | 3.4 | - | - | - | - | pF |
| **Dynamic Characteristics** | | | | | | | | | | |
| Transition Time | $t_{TRANS}$ | $R_L$ = 300 Ω, $C_L$ = 35 pF see figure 1, 2, 3 | | Room | 66 | - | 180 | - | 180 | ns |
| | | | | Full | - | - | 218 | - | 207 | |
| Enable Turn-On Time | $t_{ON}$ | | | Room | 152 | - | 250 | - | 250 | |
| | | | | Full | - | - | 295 | - | 282 | |
| Enable Turn-Off Time | $t_{OFF}$ | | | Room | 60 | - | 125 | - | 125 | |
| | | | | Full | - | - | 136 | - | 131 | |
| Break-Before-Make Time Delay | $t_D$ | | | Room | 32 | - | - | - | - | |
| | | | | Full | - | - | 13 | - | 13 | |
| Off Isolation [e] | OIRR | $R_L$ = 50 Ω, $C_L$ = 15 pF | f = 100 kHz | Room | < -90 | - | - | - | - | dB |
| | | | f = 10 MHz | Room | -65 | - | - | - | - | |
| | | | f = 100 MHz | Room | -44 | - | - | - | - | |
| Channel-to-Channel Crosstalk [e] | $X_{TALK}$ | | f = 100 kHz | Room | < -90 | - | - | - | - | |
| | | | f = 10 MHz | Room | -74 | - | - | - | - | |
| | | | f = 100 MHz | Room | -44 | - | - | - | - | |
| Bandwith, 3 dB | BW | $R_L$ = 50 Ω | DG9451 | Room | 270 | - | - | - | - | MHz |
| | | | DG9453 | Room | 525 | - | - | - | - | |
| Charge Injection [e] | Q | $V_g$ = 0 V, $R_g$ = 0 Ω, $C_L$ = 1 nF | | Room | 0.20 | - | - | - | - | pC |
| Source Off Capacitance [e] | $C_{S(off)}$ | f = 1 MHz | DG9451 | Room | 1 | - | - | - | - | pF |
| | | | DG9453 | Room | 1 | - | - | - | - | |
| Drain Off Capacitance [e] | $C_{D(off)}$ | f = 1 MHz | DG9451 | Room | 10 | - | - | - | - | |
| | | | DG9453 | Room | 3 | - | - | - | - | |
| Channel On Capacitance [e] | $C_{D(on)}$ | f = 1 MHz | DG9451 | Room | 16 | - | - | - | - | |
| | | | DG9453 | Room | 8 | - | - | - | - | |
| Total Harmonic Distortion [e] | THD | Signal = 1 $V_{RMS}$, 20 Hz to 20 kHz, $R_L$ = 600 Ω | | Room | 0.01 | - | - | - | - | % |
| **Power Supplies** | | | | | | | | | | |
| Power Supply Current | I+ | $V_{CC}$ = +5 V, $V_{EE}$ = -5 V $V_{IN(A, B, C and ENABLE)}$ = 0 V or 5 V | | Room | 0.05 | - | 1 | - | 1 | µA |
| | | | | Full | - | - | 10 | - | 10 | |
| Negative Supply Current | I- | | | Room | -0.05 | -1 | - | -1 | - | |
| | | | | Full | - | -10 | - | -10 | - | |
| Ground Current | $I_{GND}$ | | | Room | -0.05 | -1 | - | -1 | - | |
| | | | | Full | - | -10 | - | -10 | - | |


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## SPECIFICATIONS FOR UNIPOLAR SUPPLIES

| PARAMETER | SYMBOL | TEST CONDITIONS UNLESS OTHERWISE SPECIFIED $V_{CC}$ = +5 V, $V_{EE}$ = 0 V, $V_{IN(A, B, C AND ENABLE)}$ = 1.4 V, 0.3 V [a] | | TEMP. [b] | TYP. [a] | -40 °C to +125 °C | | -40 °C to +85 °C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MIN. [d] | MAX. [d] | MIN. [d] | MAX. [d] | |
| **Analog Switch** | | | | | | | | | | |
| Analog Signal Range [e] | $V_{ANALOG}$ | | | Full | - | 0 | 5 | 0 | 5 | V |
| On-Resistance | $R_{ON}$ | $I_S$ = 1 mA, $V_D$ = 0 V, +3.5 V | | Room | 105 | - | 165 | - | 165 | Ω |
| | | | | Full | - | - | 205 | - | 194 | |
| On-Resistance Match | $\Delta R_{ON}$ | $I_S$ = 1 mA, $V_D$ = +3.5 V | | Room | 3.2 | - | 8 | - | 8 | |
| | | | | Full | - | - | 13 | - | 10 | |
| On-Resistance Flatness | $R_{FLATNESS}$ | $I_S$ = 1 mA, $V_D$ = 0 V, +3 V | | Room | 17 | - | 26 | - | 26 | |
| | | | | Full | - | - | 30 | - | 28 | |
| Switch Off Leakage Current | $I_{S(off)}$ | V+ = +5.5 V, V- = 0 V, $V_D$ = 1 V/4.5 V, $V_S$ = 4.5 V/1 V | | Room | ± 0.02 | -1 | 1 | -1 | 1 | nA |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| | $I_{D(off)}$ | | | Room | ± 0.02 | -1 | 1 | -1 | 1 | |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| Channel On Leakage Current | $I_{D(on)}$ | V+ = +5.5 V, V- = 0 V, $V_D$ = $V_S$ = 1 V/4.5 V | | Room | ± 0.02 | -1 | 1 | -1 | 1 | |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| **Digital Control** | | | | | | | | | | |
| $V_{IN(A, B, C and ENABLE)}$ Low | $V_{IL}$ | | | Full | - | - | 0.3 | - | 0.3 | V |
| $V_{IN(A, B, C and ENABLE)}$ High | $V_{IH}$ | | | Full | - | 1.4 | - | 1.4 | | |
| Input Current, $V_{IN}$ Low | $I_L$ | $V_{IN(A, B, C and ENABLE)}$ under test = 0.3 V | | Full | 0.01 | -1 | 1 | -1 | 1 | µA |
| Input Current, $V_{IN}$ High | $I_H$ | $V_{IN(A, B, C and ENABLE)}$ under test = 1.4 V | | Full | 0.01 | -1 | 1 | -1 | 1 | |
| **Dynamic Characteristics** | | | | | | | | | | |
| Transition Time | $t_{TRANS}$ | $R_L$ = 300 Ω, $C_L$ = 35 pF, See Figure 1, 2, 3 | | Room | 79 | - | 205 | - | 205 | ns |
| | | | | Full | - | - | 295 | - | 285 | |
| Enable Turn-On Time | $t_{ON}$ | | | Room | 220 | - | 335 | - | 335 | |
| | | | | Full | - | - | 403 | - | 393 | |
| Enable Turn-Off Time | $t_{OFF}$ | | | Room | 93 | - | 150 | - | 150 | |
| | | | | Full | - | - | 173 | - | 163 | |
| Break-Before-Make Time Delay | $t_D$ | | | Room | 36 | - | - | - | - | |
| | | | | Full | - | - | 20 | - | 20 | |
| Charge Injection [e] | Q | $V_g$ = 0 V, $R_g$ = 0 Ω, $C_L$ = 1 nF | | Full | 0.81 | - | - | - | - | pC |
| Off Isolation [e] | OIRR | $R_L$ = 50 Ω, $C_L$ = 15 pF, f = 100 kHz | | Room | < -90 | - | - | - | - | dB |
| Channel-to-Channel Crosstalk [e] | $X_{TALK}$ | | | Room | < -90 | - | - | - | - | |
| **Dynamic Characteristics** | | | | | | | | | | |
| Source Off Capacitance [e] | $C_{S(off)}$ | f = 1 MHz | DG9451 | Room | 1 | - | - | - | - | pF |
| | | | DG9453 | Room | 1 | - | - | - | - | |
| Drain Off Capacitance [e] | $C_{D(off)}$ | f = 1 MHz | DG9451 | Room | 11 | - | - | - | - | |
| | | | DG9453 | Room | 3 | - | - | - | - | |
| Channel On Capacitance [e] | $C_{D(on)}$ | f = 1 MHz | DG9451 | Room | 17 | - | - | - | - | |
| | | | DG9453 | Room | 9 | - | - | - | - | |
| **Power Supplies** | | | | | | | | | | |
| Power Supply Current | I+ | $V_{IN(A, B, C and ENABLE)}$ = 0 V or 5 V | | Room | 0.05 | - | 1 | - | 1 | µA |
| | | | | Full | - | - | 10 | - | 10 | |
| Negative Supply Current | I- | | | Room | -0.05 | -1 | - | -1 | - | |
| | | | | Full | - | -10 | - | -10 | - | |
| Ground Current | $I_{GND}$ | | | Room | -0.05 | -1 | - | -1 | - | |
| | | | | Full | - | -10 | - | -10 | - | |


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## SPECIFICATIONS FOR UNIPOLAR SUPPLIES

| PARAMETER | SYMBOL | TEST CONDITIONS UNLESS OTHERWISE SPECIFIED $V_{CC}$ = +12 V, $V_{EE}$ = 0 V V = 1.6 V, 0.5 V [a] | | TEMP. [b] | TYP. [c] | -40 °C to +125 °C | | -40 °C to +85 °C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MAX. [d] | MIN. [d] | MIN. d | MAX. D | |
| **Analog Switch** | | | | | | | | | | |
| Analog Signal Range [e] | $V_{ANALOG}$ | | | Full | - | 0 | 12 | 0 | 12 | V |
| On-Resistance | $R_{ON}$ | $I_S$ = 1 mA, $V_D$ = 0.7 V, 6 V, 11.3 V | | Room | 68 | - | 105 | - | 105 | Ω |
| | | | | Full | - | - | 143 | - | 137 | |
| On-Resistance Match | $\Delta R_{ON}$ | $I_S$ = 1 mA, $V_D$ = +0.7 V | | Room | 4 | - | 7 | - | 7 | |
| | | | | Full | - | - | 10 | - | 8 | |
| On-Resistance Flatness | $R_{FLATNESS}$ | $I_S$ = 1 mA, $V_D$ = 0.7 V, +11.3 V | | Room | 32 | - | 45 | - | 45 | |
| | | | | Full | - | - | 49 | - | 47 | |
| Switch Off Leakage Current | $I_{S(off)}$ | V+ = +12 V, V- = 0 V $V_D$ = 1 V/11 V, $V_S$ = 11 V/1 V | | Room | ± 0.02 | -1 | 1 | -1 | 1 | nA |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| | $I_{D(off)}$ | | | Room | ± 0.02 | -1 | 1 | -1 | 1 | |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| Channel On Leakage Current | $I_{D(on)}$ | V+ = +12 V, V- = 0 V $V_D$ = $V_S$ = 1 V/11 V | | Room | ± 0.02 | -1 | 1 | -1 | 1 | |
| | | | | Full | - | -50 | 50 | -5 | 5 | |
| **Digital Control** | | | | | | | | | | |
| $V_{IN(A, B, C and ENABLE)}$ Low | $V_{IL}$ | | | Full | - | - | 0.5 | - | 0.5 | V |
| $V_{IN(A, B, C and ENABLE)}$ High | $V_{IH}$ | | | Full | - | 1.6 | - | 1.6 | - | |
| Input Current, $V_{IN}$ Low | $I_L$ | $V_{IN(A, B, C and ENABLE)}$ under test = 0.5 V | | Full | 0.01 | -1 | 1 | -1 | 1 | µA |
| Input Current, $V_{IN}$ High | $I_H$ | $V_{IN(A, B, C and ENABLE)}$ under test = 1.6 V | | Full | 0.01 | -1 | 1 | -1 | 1 | |
| **Dynamic Characteristics** | | | | | | | | | | |
| Transition Time | $t_{TRANS}$ | $R_L$ = 300 Ω, $C_L$ = 35 pF see figure 1, 2, 3 | | Room | 55 | - | 135 | - | 135 | ns |
| | | | | Full | - | - | 166 | - | 155 | |
| Enable Turn-On Time | $t_{ON}$ | | | Room | 106 | - | 185 | - | 185 | |
| | | | | Full | - | - | 219 | - | 205 | |
| Enable Turn-Off Time | $t_{OFF}$ | | | Room | 65 | - | 130 | - | 130 | |
| | | | | Full | - | - | 144 | - | 137 | |
| Break-Before-Make Time Delay | $t_D$ | | | Room | 30 | - | - | - | - | |
| | | | | Full | - | - | 12 | - | 12 | |
| Charge Injection [e] | Q | $V_g$ = 0 V, $R_g$ = 0 Ω, $C_L$ = 1 nF | | Room | 0.79 | - | - | - | - | pC |
| **Dynamic Characteristics** | | | | | | | | | | |
| Off Isolation [e] | OIRR | $R_L$ = 50 Ω, $C_L$ = 15 pF f = 100 kHz | | Room | < -90 | - | - | - | - | dB |
| Channel-to-Channel Crosstalk [e] | $X_{TALK}$ | | | Room | < -90 | - | - | - | - | |
| Source Off Capacitance [e] | $C_{S(off)}$ | f = 1 MHz | DG9451 | Room | 1 | - | - | - | - | pF |
| | | | DG9453 | Room | 1 | - | - | - | - | |
| Drain Off Capacitance [e] | $C_{D(off)}$ | f = 1 MHz | DG9451 | Room | 9 | - | - | - | - | |
| | | | DG9453 | Room | 3 | - | - | - | - | |
| Channel On Capacitance [e] | $C_{D(on)}$ | f = 1 MHz | DG9451 | Room | 15 | - | - | - | - | |
| | | | DG9453 | Room | 8 | - | - | - | - | |
| **Power Supplies** | | | | | | | | | | |
| Power Supply Current | I+ | $V_{IN(A, B, C and ENABLE)}$ = 0 V or 12 V | | Room | 0.05 | - | 1 | - | 1 | µA |
| | | | | Full | - | - | 10 | - | 10 | |
| Negative Supply Current | I- | | | Room | -0.05 | -1 | - | -1 | - | |
| | | | | Full | - | -10 | - | -10 | - | |
| Ground Current | $I_{GND}$ | | | Room | -0.05 | -1 | - | -1 | - | |
| | | | | Full | - | -10 | - | -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.*


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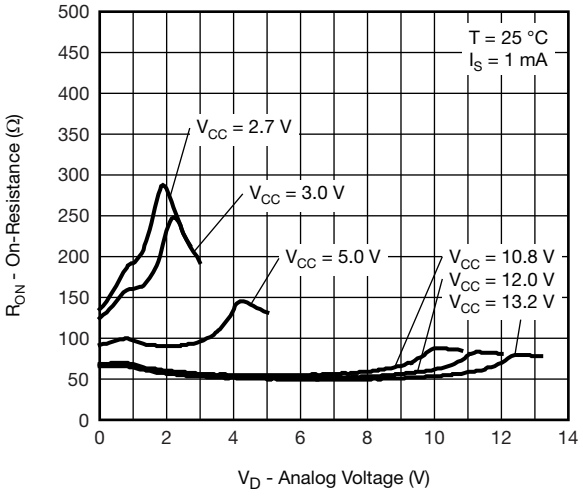
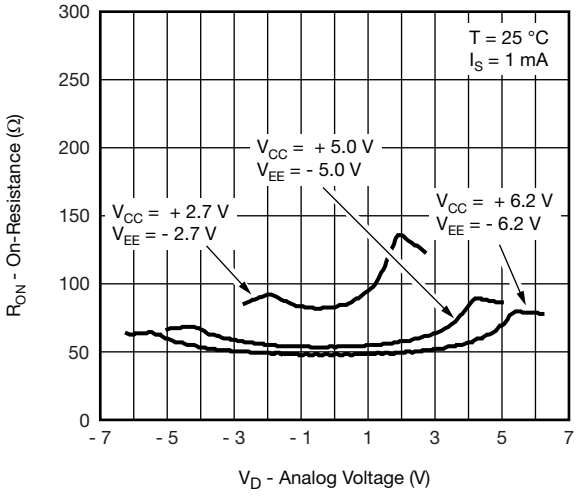
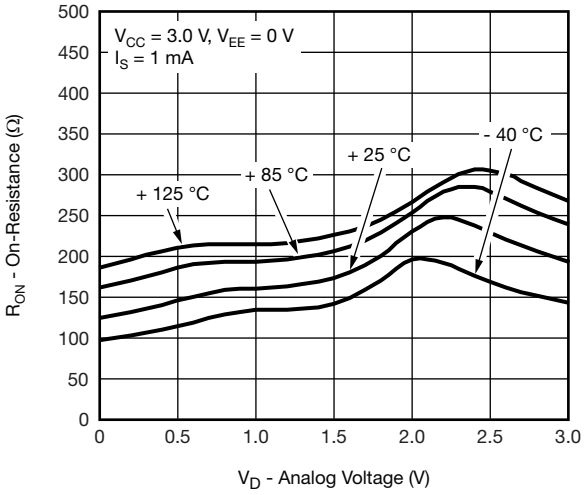
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)




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




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

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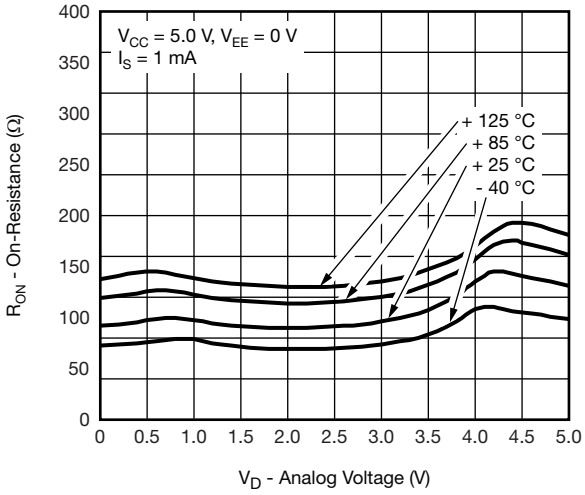


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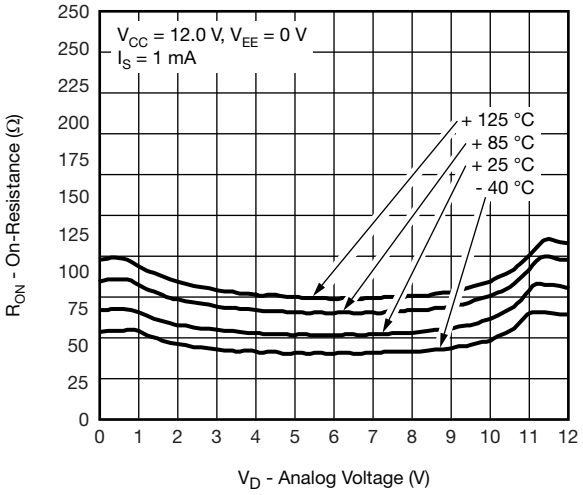


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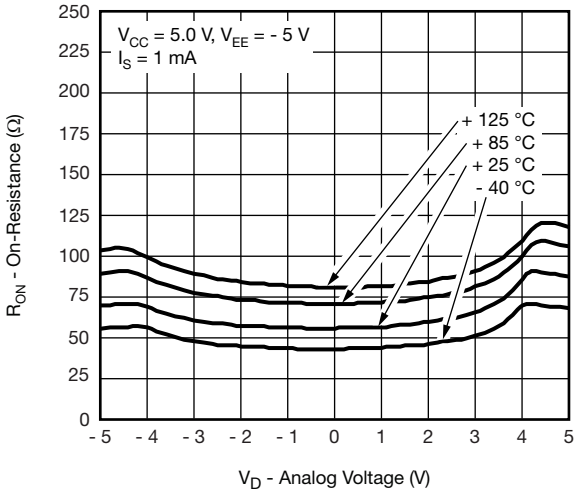


**On-Resistance vs. Analog Voltage and Temperature**


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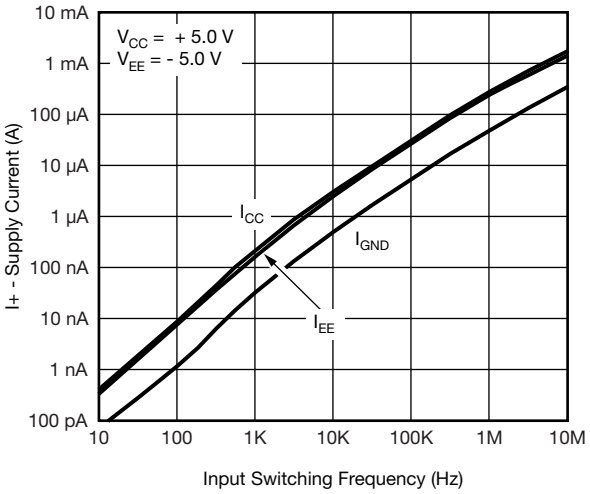
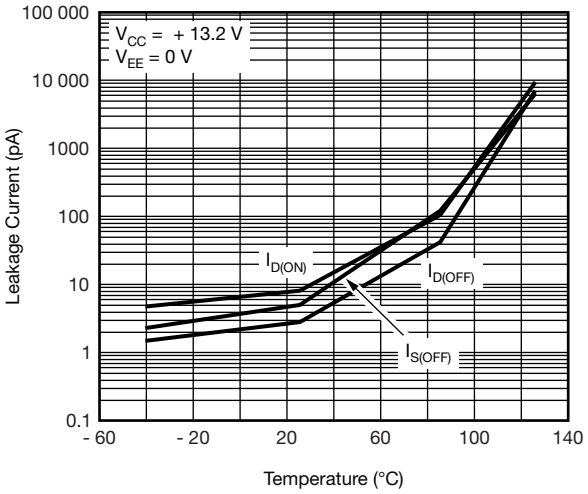
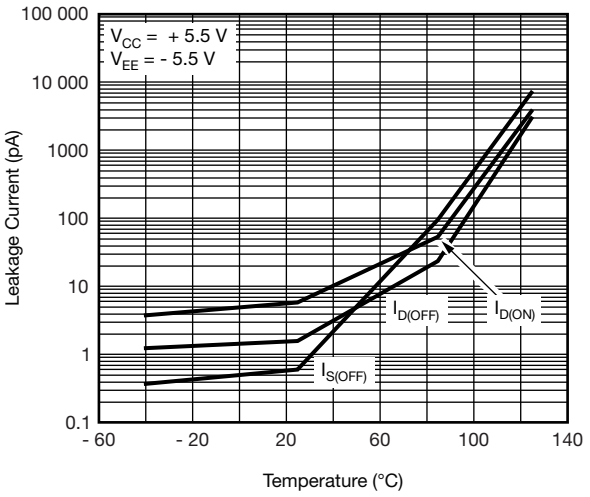
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



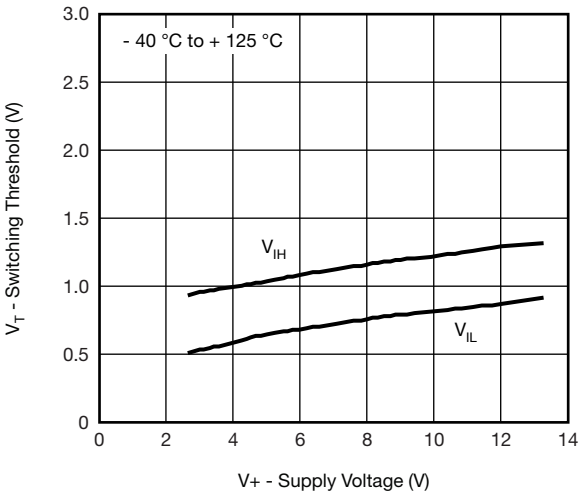

**Supply Current vs. Input Switching Frequency**



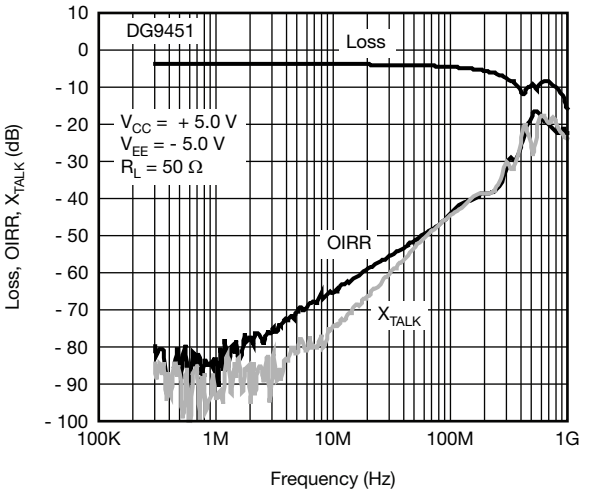

**Leakage Current vs. Temperature**



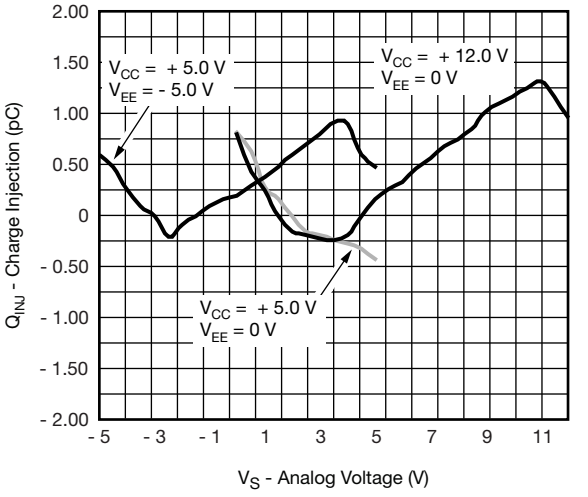

**Leakage Current vs. Temperature**




**Switching Threshold vs. Supply Voltage**




**DG9451 Insertion Loss, Off-Isolation, Crosstalk vs. Frequency**




**DG9451 Charge Injection vs. Analog Voltage**



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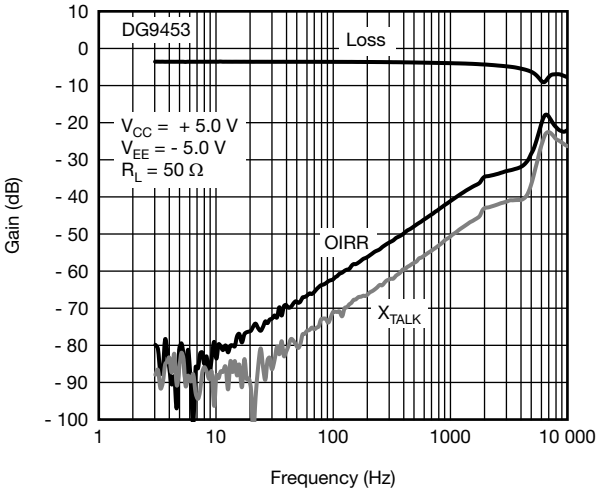
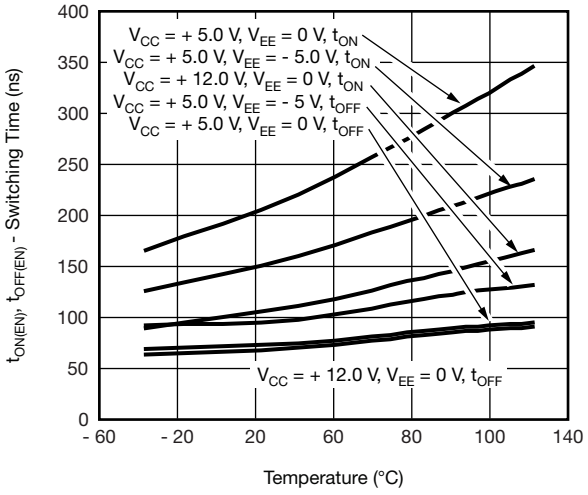



**Frequency Response**




**Switching Time vs. Temperature**

## TEST CIRCUITS

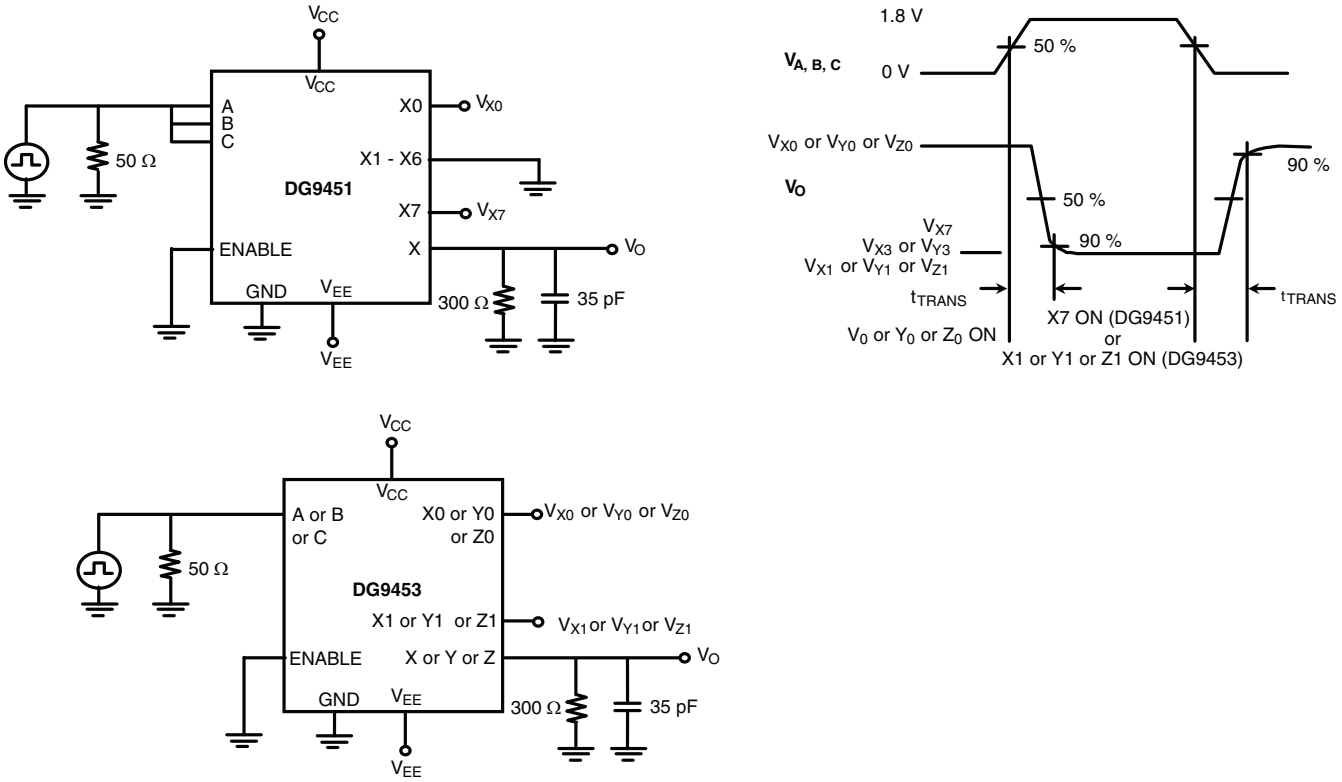



**Fig. 1 - Transition Time**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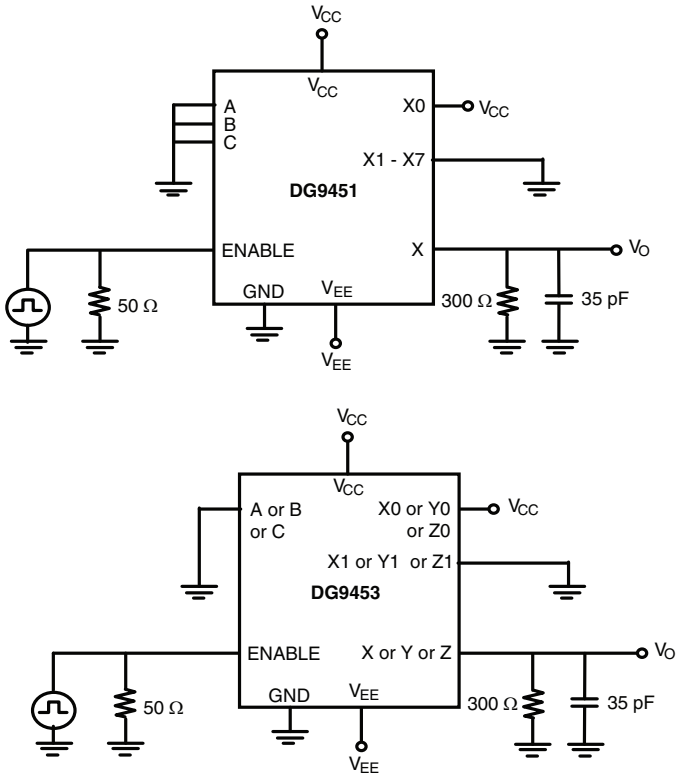
## TEST CIRCUITS



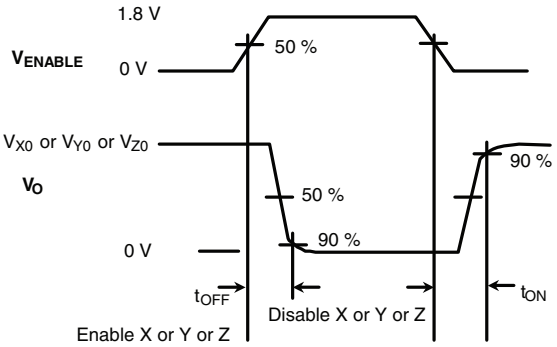
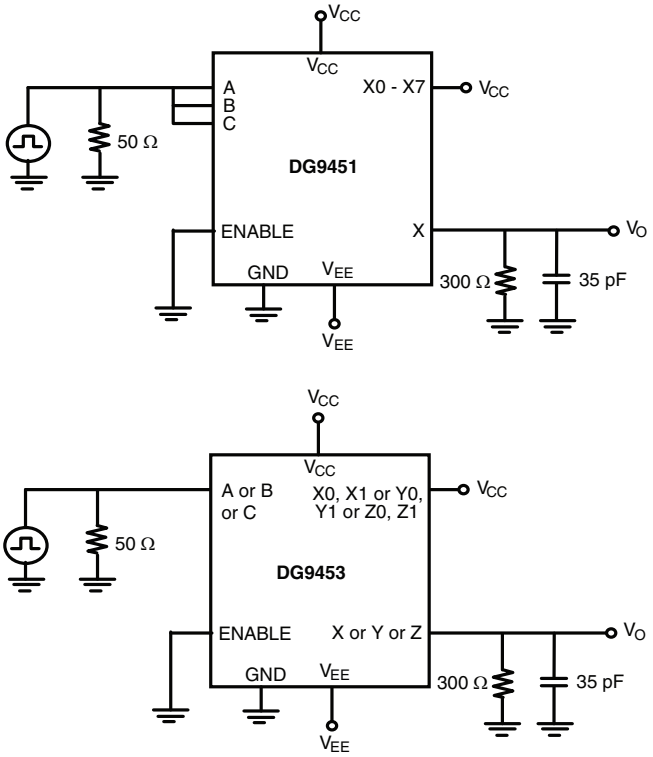




**Fig. 2 - Enable Switching Time**



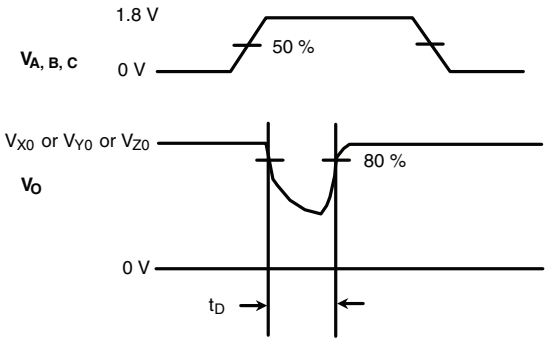




**Fig. 3 - Break-Before-Make**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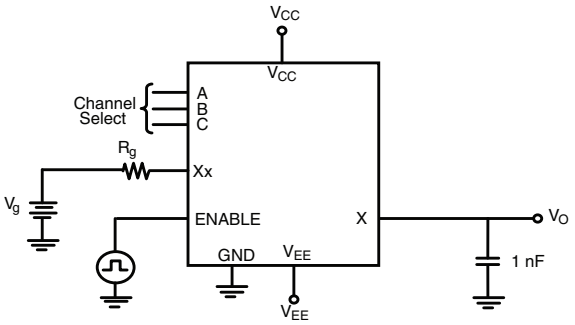
## TEST CIRCUITS



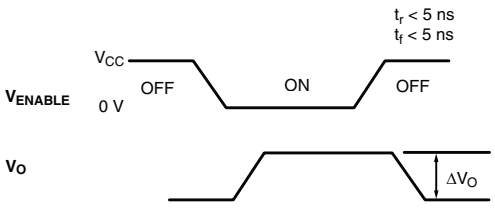




**Fig. 4 - Charge Injection**

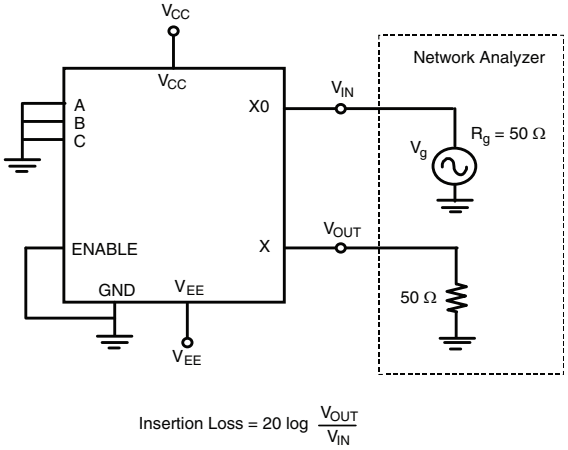



**Fig. 5 - Insertion Loss**

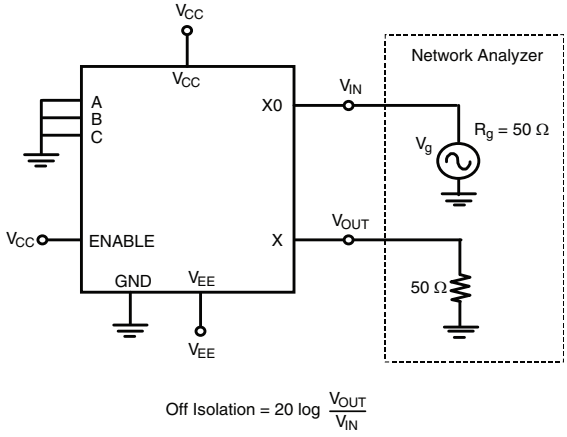



**Fig. 7 - Off Isolation**

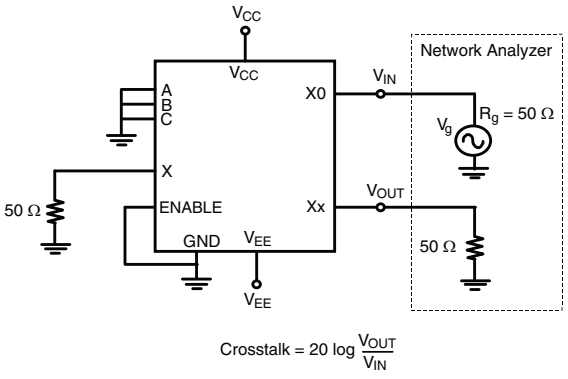



**Fig. 6 - Crosstalk**

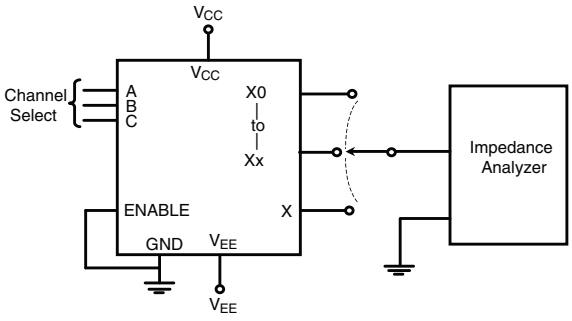



**Fig. 8 - Source, Drain Capacitance**

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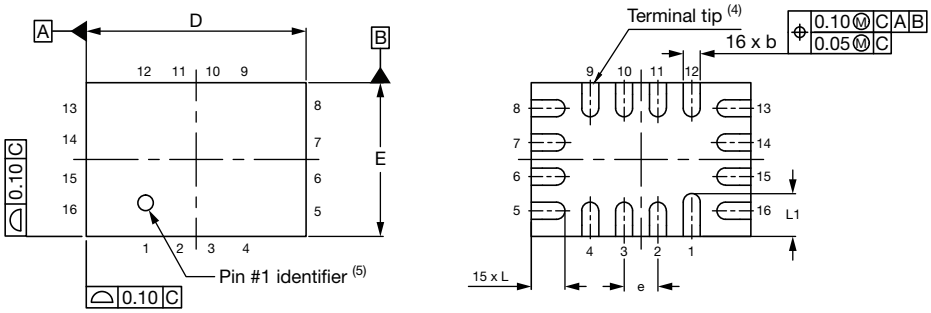
# Thin miniQFN16 Case Outline




Top view

Bottom view

Side view

| DIMENSIONS | MILLIMETERS (1) | | | 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 (3) | 16 | | | 16 | | |
| Nd (3) | 4 | | | 4 | | |
| Ne (3) | 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



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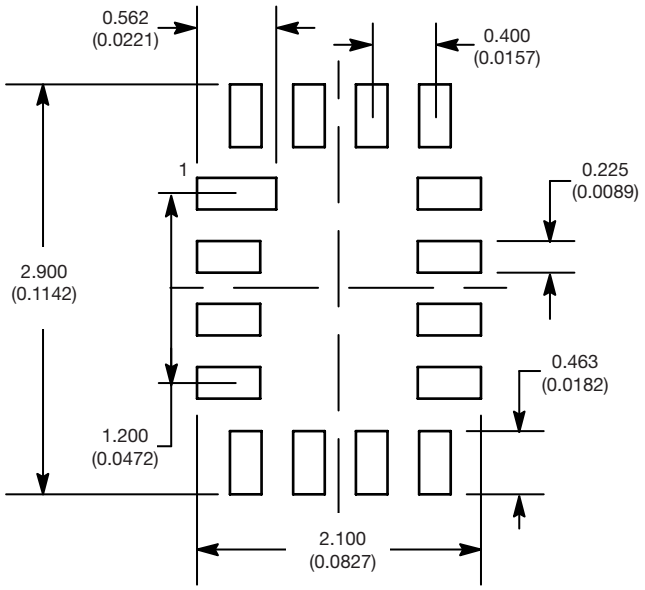
**RECOMMENDED MINIMUM PADS FOR MINI QFN 16L**




Mounting Footprint
Dimensions in mm (inch)



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