



0.45-Ω CMOS, 1.65-V to 3.6-V, Dual DPDT Analog Switch

FEATURES

- Low Voltage Operation (1.65 V to 3.6 V)
- Low On-Resistance - r_{ON} : 0.45 Ω @ 2.7 V
- Fast Switching: t_{ON} = 28 ns
 t_{OFF} = 17 ns
- QFN-16 (3x3) Package

BENEFITS

- Reduced Power Consumption
- High Accuracy
- Reduce Board Space
- TTL/1.8-V Logic Compatible
- High Bandwidth

APPLICATIONS

- Cellular Phones
- Speaker Headset Switching
- Audio and Video Signal Routing
- PCMCIA Cards
- Battery Operated Systems

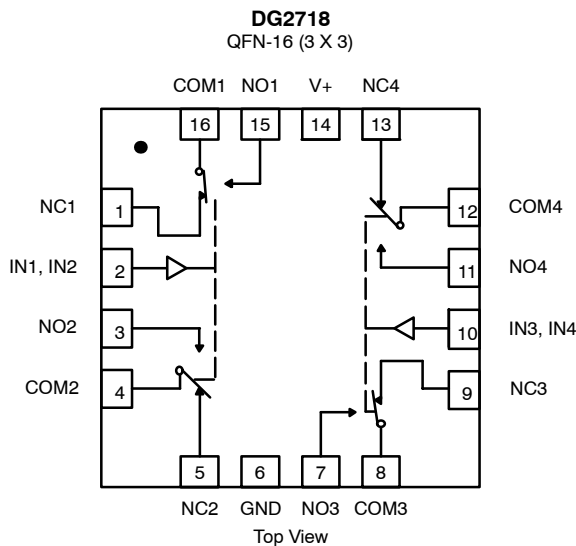
DESCRIPTION

The DG2718 is a dual double-pole/double-throw monolithic CMOS analog switch designed for high performance switching of analog signals. Combining low power, high speed, low on-resistance and small physical size, the DG2718 is ideal for portable and battery powered applications requiring high performance and efficient use of board space.

The DG2718 is built on Vishay Siliconix's low voltage process. An epitaxial layer prevents latchup. Break-before-make is guaranteed.

The switch conducts equally well in both directions when on, and blocks up to the power supply level when off.

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



NOTE:

Underside exposed pad has no device electrical connection. It is recommended that no electrical connection is made to it.

| TRUTH TABLE | | |
|-------------|-----------------|-----------------|
| Logic | NC1, 2, 3 and 4 | NO1, 2, 3 and 4 |
| 0 | ON | OFF |
| 1 | OFF | ON |

| ORDERING INFORMATION* | | |
|-----------------------|--------------------------------------|-------------|
| Temp Range | Package | Part Number |
| -40 to 85°C | 16-Pin QFN (3 x 3 mm) Variation 2 | DG2718DN |

* Lead-Free Version Available

ABSOLUTE MAXIMUM RATINGS

Reference to GND

| | |
|-----------------------------------------------------|----------------------|
| V+ | -0.3 to +4.0 V |
| IN, COM, NC, NO ^a | -0.3 to (V+ + 0.3 V) |
| Current (Any terminal except NO, NC or COM) | 30 mA |
| Continuous Current (NO, NC, or COM) | ±300 mA |
| Peak Current | ±500 mA |
| (Pulsed at 1 ms, 10% duty cycle) | |
| Storage Temperature (D Suffix) | -65 to 150°C |
| Package Solder Reflow Conditions ^d | |
| 16-Pin QFN (3 x 3 mm) | 250°C |

Power Dissipation (Packages)^b

| | |
|---------------------------|---------|
| QFN-16 ^c | 1385 mW |
|---------------------------|---------|

- Notes:
- Signals on NC, NO, or COM or IN exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
 - All leads welded or soldered to PC Board.
 - Derate 17.3 mW/°C above 70°C
 - Manual soldering with 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 (V+ = 1.8 V) | | | | | | | | | |
|--------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|-----------------------|------------------|------------------|------|-----|----|
| Parameter | Symbol | Test Conditions Otherwise Unless Specified V+ = 1.8 V, V _{IN} = 0.4 or 1.1 V ^e | Temp ^a | Limits -40 to 85°C | | | Unit | | |
| | | | | Min ^b | Typ ^c | Max ^b | | | |
| Analog Switch | | | | | | | | | |
| Analog Signal Range ^d | V _{NO} , V _{NC} , V _{COM} | | Full | 0 | | V+ | V | | |
| On-Resistance ^d | r _{ON} | V+ = 1.8 V, V _{COM} = 0.2 V/0.9 V, I _{NO} , I _{NC} = 100 mA | Room Full | | 0.7 | 2.0 2.8 | Ω | | |
| Digital Control | | | | | | | | | |
| Input High Voltage | V _{INH} | | Full | 1.1 | | | V | | |
| Input Low Voltage | V _{INL} | | Full | | | 0.4 | | | |
| Input Capacitance | C _{in} | | Full | | 6 | | pF | | |
| Input Current | I _{INL} or I _{INH} | V _{IN} = 0 or V+ | Full | -1 | | 1 | μA | | |
| Dynamic Characteristics | | | | | | | | | |
| Turn-On Time | t _{ON} | V _{NO} or V _{NC} = 1.5 V, R _L = 50 Ω, C _L = 35 pF | Room Full | | 62 | 94 92 | ns | | |
| Turn-Off Time | t _{OFF} | | Room Full | | 24 | 52 55 | | | |
| Break-Before-Make Time | t _d | | Full | 16 | | | | | |
| Charge Injection ^d | Q _{INJ} | C _L = 1 nF, V _{GEN} = 0 V, R _{GEN} = 0 Ω | Room | | 65 | | pC | | |
| Off-Isolation ^d | OIRR | R _L = 50 Ω, C _L = 5 pF, f = 100 kHz | Room | | -74 | | dB | | |
| Crosstalk ^d | X _{TALK} | | Room | | -74 | | | | |
| N _O , N _C Off Capacitance ^d | C _{NO(off)} | V _{IN} = 0 or V+, f = 1 MHz | Room | | 108 | | pF | | |
| | C _{NC(off)} | | Room | | 108 | | | | |
| Channel-On Capacitance ^d | C _{NO(on)} | | Room | | 225 | | | | |
| | C _{NC(on)} | | Room | | 225 | | | | |
| Power Supply | | | | | | | | | |
| Power Supply Current | I+ | | V _{IN} = 0 or V+ | Full | | | | 1.0 | μA |



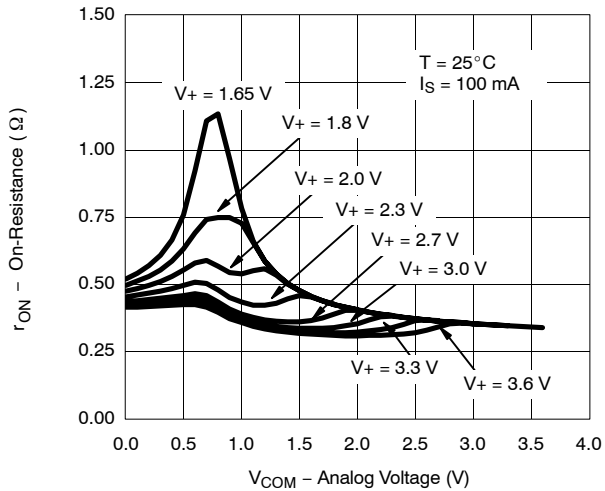
| SPECIFICATIONS (V+ = 3 V) | | | | | | | | | |
|--------------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------|-----------------------|------------------|------------------|------|-----|---|
| Parameter | Symbol | Test Conditions Otherwise Unless Specified V+ = 3 V, ±10%, VIN = 0.5 or 1.4 V ^e | Temp ^a | Limits –40 to 85°C | | | Unit | | |
| | | | | Min ^b | Typ ^c | Max ^b | | | |
| Analog Switch | | | | | | | | | |
| Analog Signal Range ^d | V _{NO} , V _{NC} , V _{COM} | | Full | 0 | | V+ | V | | |
| On-Resistance ^d | r _{ON} | V+ = 2.7 V, V _{COM} = 0.2 V/1.5 V, I _{NO} , I _{NC} = 100 mA | Room Full | | 0.45 | 0.6 0.7 | Ω | | |
| r _{ON} Flatness ^d | r _{ON} Flatness | V+ = 2.7 V V _{COM} = 0 to V+, I _{NO} , I _{NC} = 100 mA | Room | | 0.1 | 0.15 | | | |
| r _{ON} Match ^d | Δr _{ON} | | Room | | 0.05 | | | | |
| Switch Off Leakage Current | I _{NO(off)} , I _{NC(off)} | V+ = 3.3 V, V _{NO} , V _{NC} = 0.3 V/3 V V _{COM} = 3 V/0.3 V | Room Full | –1 –10 | | 1 10 | nA | | |
| | I _{COM(off)} | | Room Full | –1 –10 | | 1 10 | | | |
| Channel-On Leakage Current | I _{COM(on)} | V+ = 3.3 V, V _{NO} , V _{NC} = V _{COM} = 0.3 V/3 V | Room Full | –1 –10 | | 1 10 | | | |
| Digital Control | | | | | | | | | |
| Input High Voltage | V _{INH} | | Full | 1.4 | | | V | | |
| Input Low Voltage | V _{INL} | | Full | | | 0.5 | | | |
| Input Capacitance | C _{in} | | Full | | 6 | | pF | | |
| Input Current | I _{INL} or I _{INH} | V _{IN} = 0 or V+ | Full | –1 | | 1 | μA | | |
| Dynamic Characteristics | | | | | | | | | |
| Turn-On Time | t _{ON} | V _{NO} or V _{NC} = 1.5 V, R _L = 50 Ω, C _L = 35 pF | Room Full | | 28 | 57 60 | ns | | |
| Turn-Off Time | t _{OFF} | | Room Full | | 17 | 45 47 | | | |
| Break-Before-Make Time | t _d | | Full | 1 | | | | | |
| Charge Injection ^d | Q _{INJ} | C _L = 1 nF, V _{GEN} = 0 V, R _{GEN} = 0 Ω | Room | | 232 | | pC | | |
| Off-Isolation ^d | OIRR | R _L = 50 Ω, C _L = 5 pF, f = 100 kHz | Room | | –75 | | dB | | |
| Crosstalk ^d | X _{TALK} | | Room | | –75 | | | | |
| N _O , N _C Off Capacitance ^d | C _{NO(off)} | V _{IN} = 0 or V+, f = 1 MHz | Room | | 102 | | pF | | |
| | C _{NC(off)} | | Room | | 102 | | | | |
| Channel-On Capacitance ^d | C _{NO(on)} | | Room | | 234 | | | | |
| | C _{NC(on)} | | Room | | 234 | | | | |
| Power Supply | | | | | | | | | |
| Power Supply Range | V+ | | | | 2.7 | | | 3.3 | V |
| Power Supply Current | I+ | V _{IN} = 0 or V+ | Full | | | 1.0 | μA | | |

Notes:

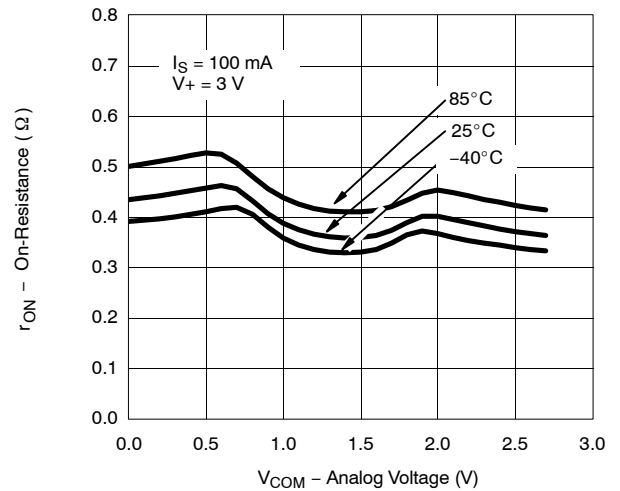
- Room = 25°C, Full = as determined by the operating suffix.
- Typical values are for design aid only, not guaranteed nor subject to production testing.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Guarantee by design, nor subjected to production test.
- V_{IN} = input voltage to perform proper function.
- Guaranteed by 5-V leakage testing, not production tested.

TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

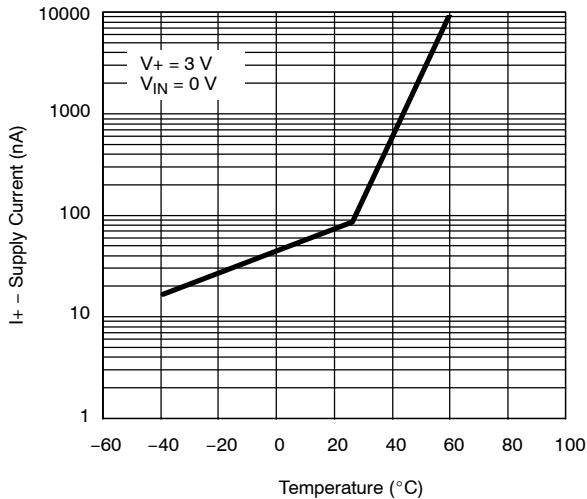
r_{ON} vs. V_{COM} and Supply Voltage



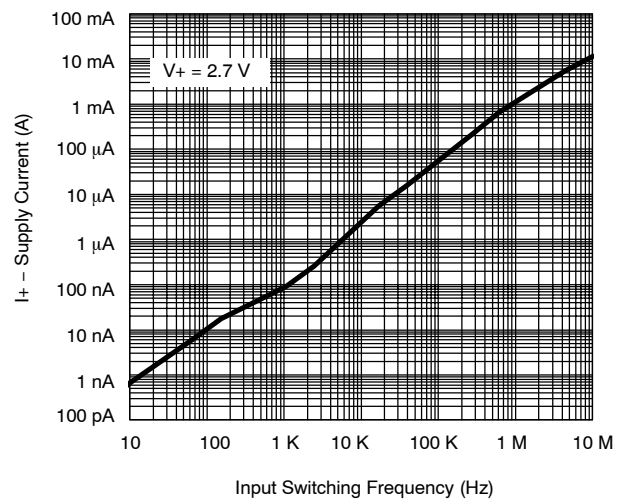
r_{ON} vs. Analog Voltage and Temperature



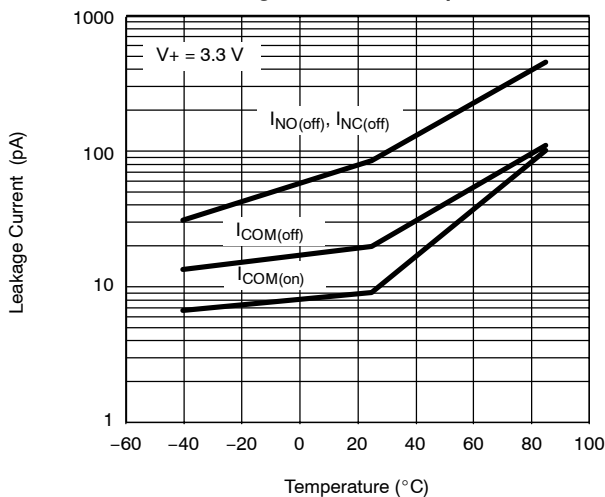
Supply Current vs. Temperature



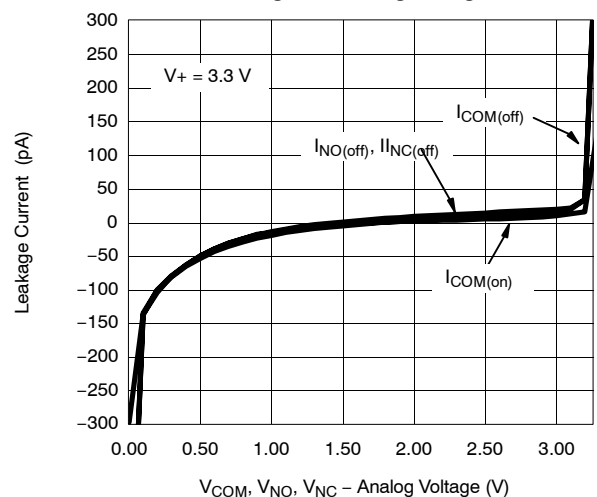
Supply Current vs. Input Switching Frequency



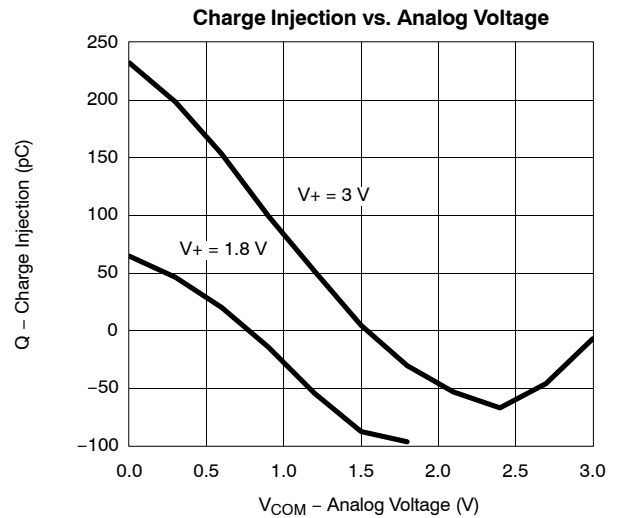
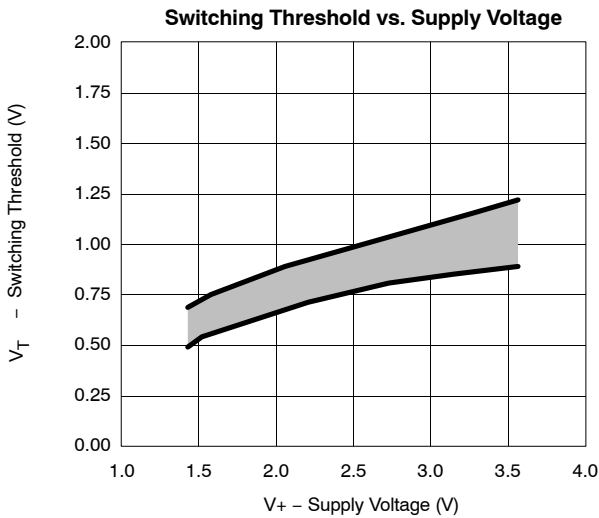
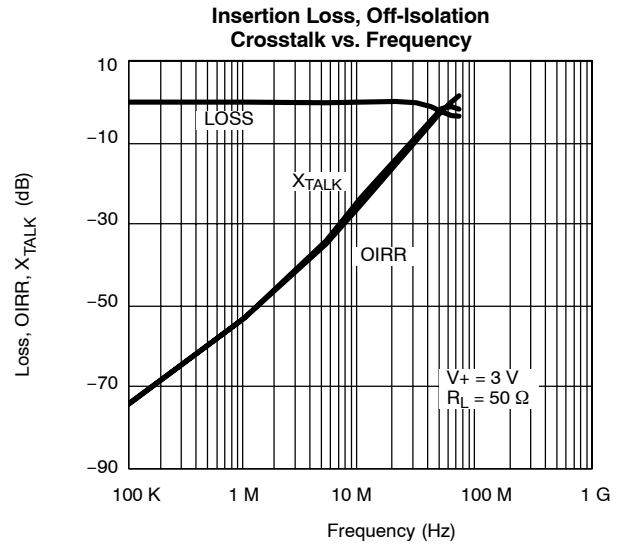
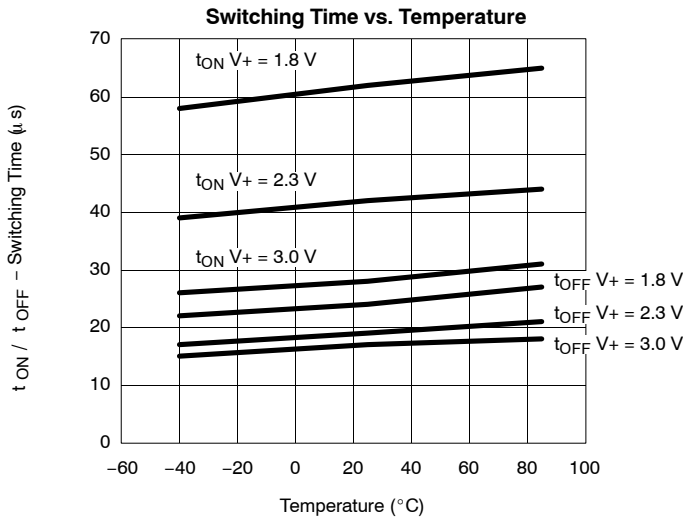
Leakage Current vs. Temperature



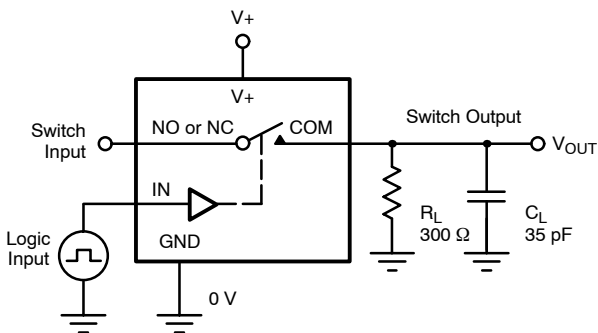
Leakage vs. Analog Voltage



TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

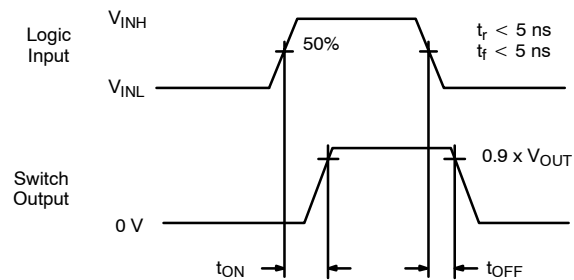


TEST CIRCUITS



C_L (includes fixture and stray capacitance)

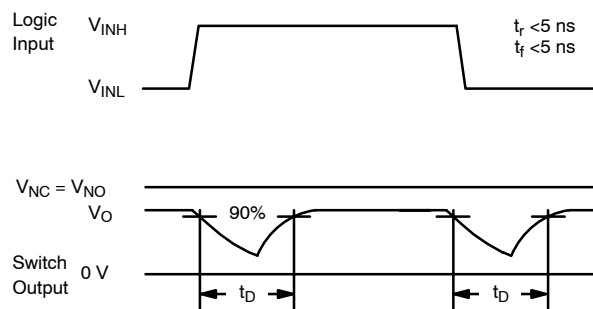
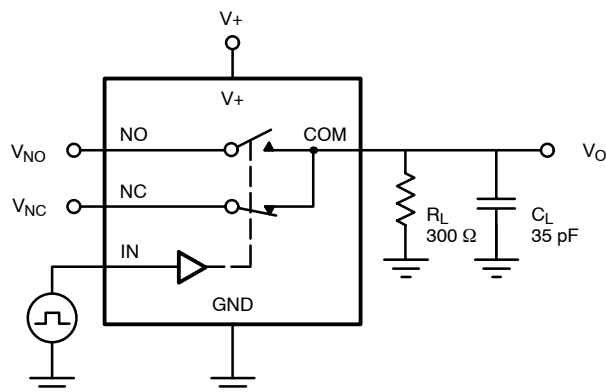
$$V_{OUT} = V_{COM} \left(\frac{R_L}{R_L + R_{ON}} \right)$$



Logic "1" = Switch On
Logic input waveforms inverted for switches that have the opposite logic sense.

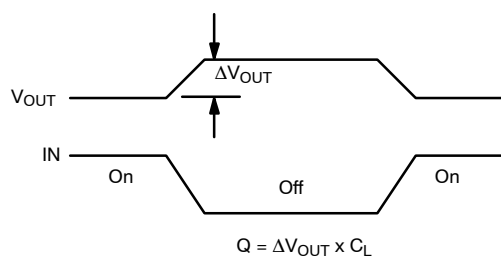
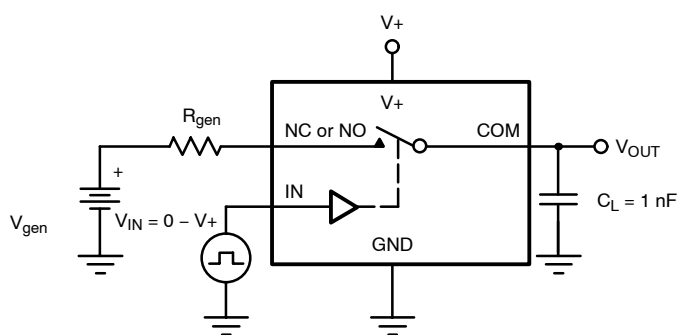
Figure 1. Switching Time

TEST CIRCUITS



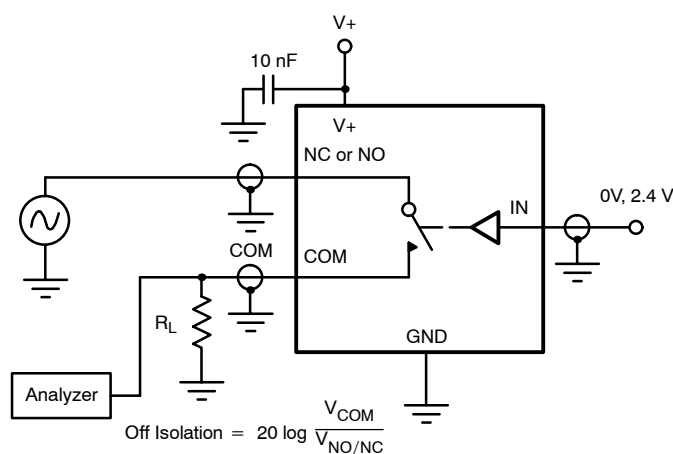
C_L (includes fixture and stray capacitance)

Figure 2. Break-Before-Make Interval



IN depends on switch configuration: input polarity determined by sense of switch.

Figure 3. Charge Injection



$$\text{Off Isolation} = 20 \log \frac{V_{COM}}{V_{NO/NC}}$$

Figure 4. Off-Isolation

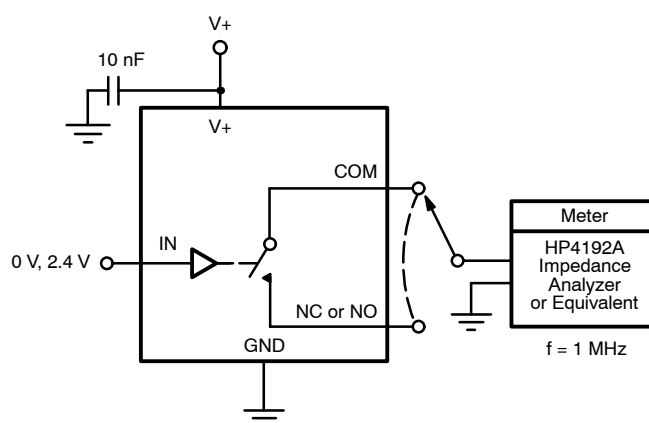


Figure 5. Channel Off/On Capacitance