



The Future of Analog IC Technology®

MP2735/MP2736

Low-Voltage 0.45Ω Dual SPDT Analog Switches

MP2735 NOT RECOMMENDED FOR NEW DESIGNS. REFER TO MP2736

GENERAL DESCRIPTION

The MP2735/MP2736 are low voltage, low on-resistance, dual single-pole, double-throw (SPDT) monolithic CMOS analog switches designed for high performance switching of analog signals. Combining low-power, high speed, low on-resistance, and small package size, the MP2735/MP2736 are ideal for portable and battery power applications.

The MP2735/MP2736 have an operation range from 1.65V to 5.5V single supply. The MP2735 has two separate control pins and two separate SPDT switches. The MP2736 includes an \overline{EN} pin. All switches are at high impedance mode when the \overline{EN} is high.

The MP2735/MP2736 are guaranteed 1.65V logic compatible for $V+ < 3.3V$, allowing the easy interface with low voltage DSP or MCU control logic and ideal for one cell Li-ion battery direct power.

The switch conducts signals within power rails equally well in both directions when on, and blocks up to the power supply level when off. Break-before-make is guaranteed.

The MP2735/MP2736 are offered in a QFN10 package.

FEATURES

- Low Voltage Operation (1.65V to 5.5V)
- Low On-Resistance - R_{ON} : 0.45Ω at 2.7V
- Fast Switching: T_{ON} = 29ns at 2.7V
- T_{OFF} = 23ns at 2.7V
- Latch-Up Current $> 300mA$ (JESD78)
- 1.4mm x 1.8mm QFN10 Package
- ESD Human-Body Model $\pm 4000V$

APPLICATIONS

- Cellular Phones
- Speaker Headset Switching
- Audio and Video Signal Routing
- PCMCIA Cards
- Battery Powered Systems
- Portable Media Player
- Handheld Test Instruments

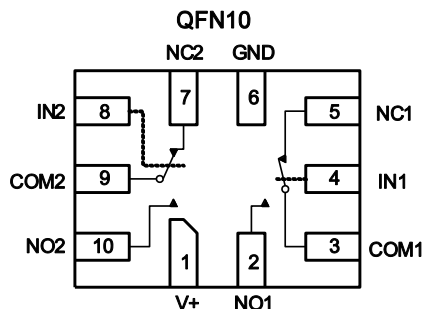
TRUTH TABLE

| | IN1/2 | \overline{EN} | NC1/2 | NO1/2 |
|---------------|-------|-----------------|-------|-------|
| MP2735 | 0 | - | ON | OFF |
| | 1 | - | OFF | ON |
| MP2736 | 0 | 1 | OFF | OFF |
| | 1 | 1 | OFF | OFF |
| | 0 | 0 | ON | OFF |
| | 1 | 0 | OFF | ON |

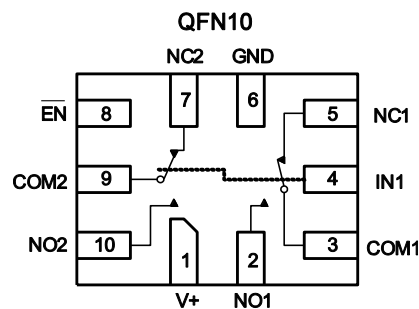
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FUNCTIONAL BLOCK DIAGRAM PIN CONFIGURATION

MP2735DQG



MP2736DQG

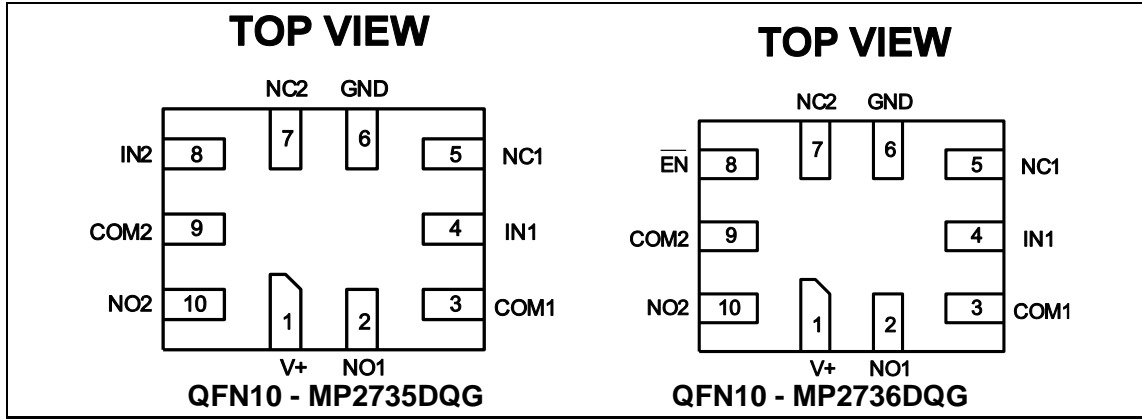


ORDERING INFORMATION

| Part Number* | Package | Top Marking | Free Air Temperature (T _A) |
|--------------|-------------------------|-------------|--|
| MP2735DQG | QFN10 (1.4mm x1.8mm) | 2T | -40°C to +85°C |
| MP2736DQG | | AM | |

* For Tape & Reel, add suffix -Z (e.g. MP2735DQG-Z).
 For RoHS compliant packaging, add suffix -LF (e.g. MP2735DQG-LF-Z)

PACKAGE REFERENCE



ABSOLUTE MAXIMUM RATINGS

V+ Supply Voltage -0.3V to +6V
 IN/COM/NC/NO Voltage ⁽¹⁾ ... -0.3V to V+ + 0.3V
 Current
 (Any terminal except NO, NC or COM)
30mA
 Continuous Current (NO, NC or COM)
±250mA
 Peak Current
 (Pulsed at 1ms, 10% duty cycle)±500mA
 Storage Temperature..... -65°C to +150°C
 Power Dissipation (QFN10 ⁽²⁾ ⁽³⁾208mW

Notes:

- 1) Signals on NC, or COM or IN exceeding V+ will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
- 2) Derate 4.0mW/°C above 70°C.
- 3) All leads welded or soldered to PC Board.

ELECTRICAL CHARACTERISTICS

V+=3V, ±10%, V_{IN}=0.4 or 1.65V, unless otherwise noted.

| Parameter | Symbol | Condition | Min | Typ | Max | Units |
|----------------------------|--------------------------------------|---|---------------------------------|--------------------------|------|-------|
| Analog Switch | | | | | | |
| Analog Signal Range | V _{analog} | r _{DS(on)} , T _A = -40°C to +85°C | 0 | | V+ | V |
| On-Resistance | r _{DS(on)} | V+=2.7V, I _{NO/NC} =100mA, V _{COM} =0.5V | T _A = +25°C | 0.28 | 0.45 | Ω |
| | | V+=2.7V, I _{NO/NC} =100mA, V _{COM} =1.5V | | | | |
| | | V+=2.7V, I _{NO/NC} =100mA, V _{COM} =0.5V | T _A = -40°C to +85°C | 0.30 | | |
| | | V+=2.7V, I _{NO/NC} =100mA, V _{COM} =1.5V | | | | |
| | | V+=5.5V, I _{NO/NC} =100mA, V _{COM} =0.9V | T _A = +25°C | 0.20 | 0.30 | |
| | | V+=5.5V, I _{NO/NC} =100mA, V _{COM} =2.5V | | | | |
| | | V+=5.5V, I _{NO/NC} =100mA, V _{COM} =0.9V | T _A = -40°C to +85°C | 0.25 | | |
| | | V+=5.5V, I _{NO/NC} =100mA, V _{COM} =2.5V | | | | |
| r _{ON} Match | Δr _{on} | V+=2.7V, I _{NO/NC} =100mA, V _{COM} =0.5V/1.5V | T _A = +25°C | 0.01 | 0.02 | |
| | | V+=5.5V, I _{NO/NC} =100mA, V _{COM} =0.9V/2.5V | | | | |
| r _{ON} Flatness | r _{ON} Flatness | V+=2.7V, I _{NO/NC} =100mA, V _{COM} =0.5V/1.5V | | | 0.15 | |
| Switch Off Leakage Current | I _{NO/NC(off)} | V+=5.5V, V _{NO/NC} =0.3V/4.0V, V _{COM} =4.0V/0.3V | T _A = +25°C | -40 | 40 | nA |
| | | | T _A = -40°C to +85°C | -100 | 100 | |
| | T _A = +25°C | | -40 | 40 | | |
| | T _A = -40°C to +85°C | | -100 | 100 | | |
| Channel-On Leakage Current | I _{COM(on)} | V+=5.5V, V _{NO/NC} =V _{COM} =4.0V/0.3V | T _A = +25°C | -40 | 40 | |
| | | | T _A = -40°C to +85°C | -150 | 150 | |
| Digital Control | | | | | | |
| Input High Voltage | V _{INH} | | T _A = -40°C to +85°C | 1.65 | | V |
| Input Low Voltage | V _{INL} | | | | 0.4 | |
| Input Capacitance | C _{IN} | | | 6 | | pF |
| Input Current | I _{INL} OR I _{INH} | | | V _{IN} =0 or V+ | -1 | 1 |

ELECTRICAL CHARACTERISTICS (continued)
V+=3V, ±10%, V_{IN}=0.4 or 1.65V, unless otherwise noted.

| Parameter | Symbol | Condition | Min | Typ | Max | Units | |
|--|----------------------|--|---------------------------------|--|-----|-------|-----|
| Dynamic Characteristics | | | | | | | |
| Break-Before-Make Time | t _{BBM} | V+=3.6V, V _{NO} /V _{NC} =1.5V, R _L =50Ω, C _L =35pF | T _A = +25°C | 10 | | ns | |
| Turn-On Time | t _{ON} | | | | 24 | | 36 |
| Turn-Off Time | t _{OFF} | | T _A = -40°C to +85°C | | | | 40 |
| | | | T _A = +25°C | | 20 | | 30 |
| Enable Turn-On Time MP2736 (EN) | t _{ON(EN)} | | T _A = -40°C to +85°C | | | | 35 |
| | | | T _A = +25°C | | 24 | | 36 |
| Enable Turn-Off Time MP2736 ($\overline{\text{EN}}$) | t _{OFF(EN)} | | T _A = -40°C to +85°C | | | | 40 |
| | | | T _A = +25°C | | 20 | | 30 |
| Off-Isolation ⁽⁴⁾ | OIRR | R _L =50Ω, C _L =5pF, f=100kHz | T _A = +25°C | | -70 | dB | |
| Crosstalk ⁽⁴⁾ | XTALK | | | | -70 | dB | |
| 3dB Bandwidth | | | | R _L =50Ω, C _L =5pF | | 50 | MHz |
| NO, NC Off Capacitance ⁽⁴⁾ | C _{NO(off)} | V _{IN} =0V, or V+, f=1MHz | T _A = +25°C | | 55 | pF | |
| | C _{NC(off)} | | | | 55 | | |
| Channel On Capacitance ⁽⁴⁾ | C _{NO(on)} | | | | 130 | | |
| | C _{NC(on)} | | | | 130 | | |
| Power Supply | | | | | | | |
| Power Supply Range | V+ | | | 1.65 | | 5.5 | V |
| Power Supply Current | I+ | V _{IN} =0 or V+ | T _A = -40°C to +85°C | -1 | | 1 | μA |

Note:

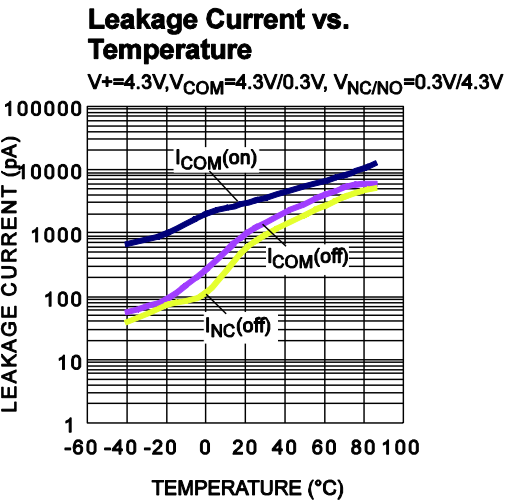
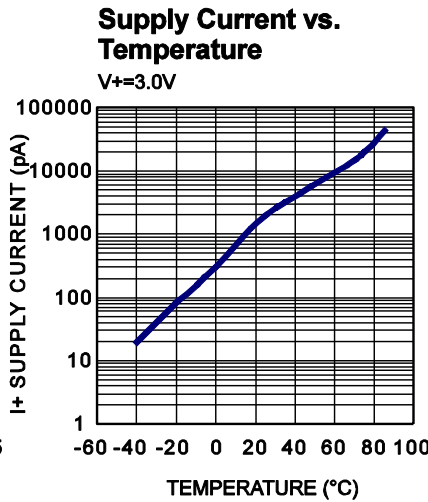
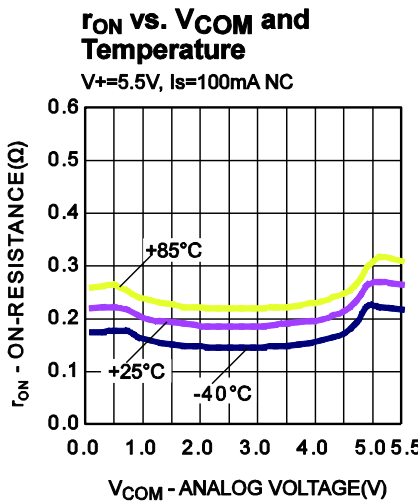
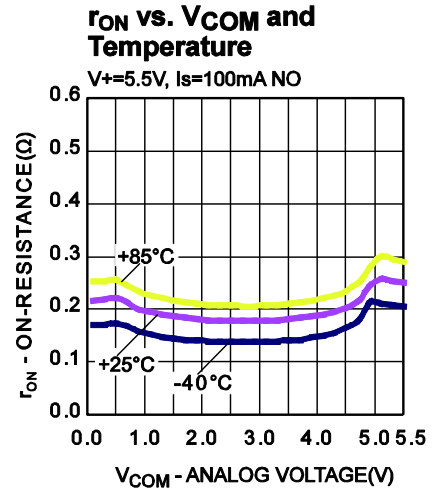
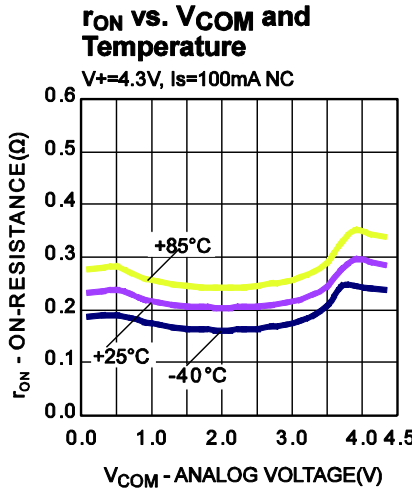
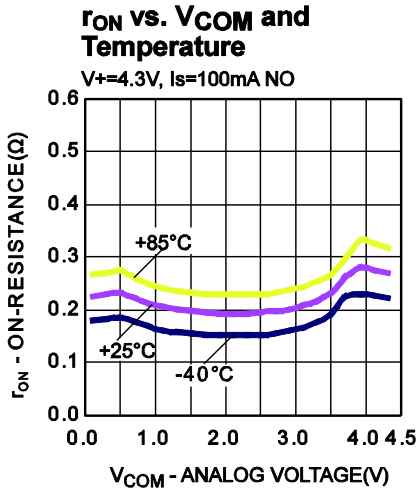
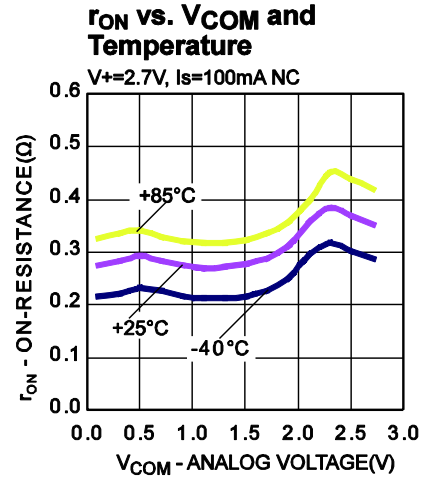
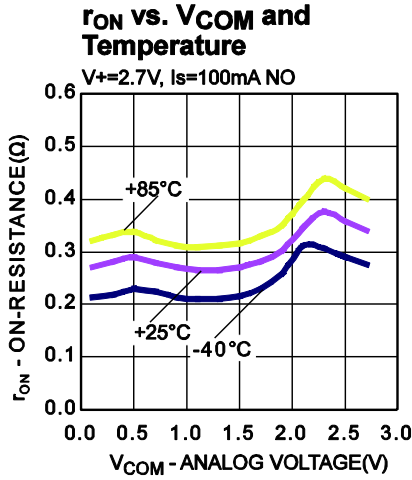
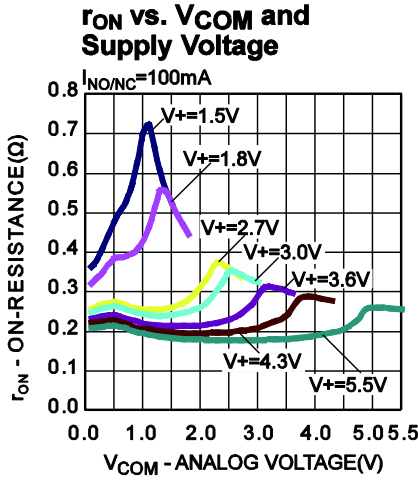
- 4) Guarantee by design, not subjected to production test.

PIN FUNCTIONS

| (MP2735DQG) Pin # | (MP2736DQG) Pin # | Name | Description |
|-----------------------|-----------------------|-----------------|--|
| 1 | 1 | V+ | Supply Voltage |
| 2 | 2 | NO1 | Normally open I/O port of switch1 |
| 3 | 3 | COM1 | Common I/O port for NC and NO channels of switch1 |
| 4 | 4 | IN1 | Channel select signal for switch1. IN1 high, NO1 channel is selected. Otherwise, NC1 channel is selected in default. For MP2736, IN1 controls both switch1 and switch2 |
| 5 | 5 | NC1 | Normally closed I/O port of switch1 |
| 6 | 6 | GND | Ground |
| 7 | 7 | NC2 | Normally closed I/O port of switch2 |
| 8 | | IN2 | Channel select signal for switch2. IN2 high, NO2 channel is selected. Otherwise, NC2 channel is selected in default |
| | 8 | \overline{EN} | Enable for two channels, active low |
| 9 | 9 | COM2 | Common I/O port for NC and NO channels of switch2 |
| 10 | 10 | NO2 | Normally open I/O port of switch2 |

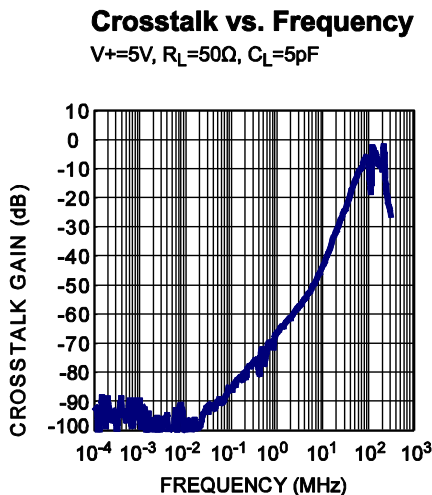
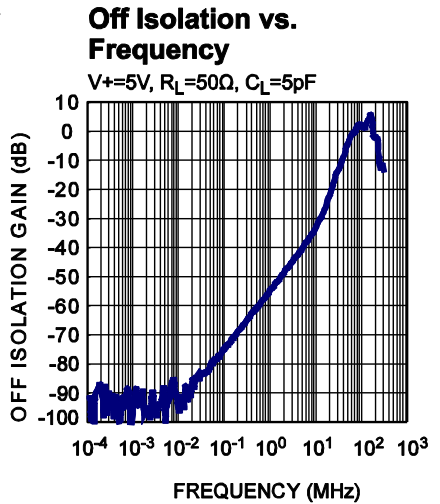
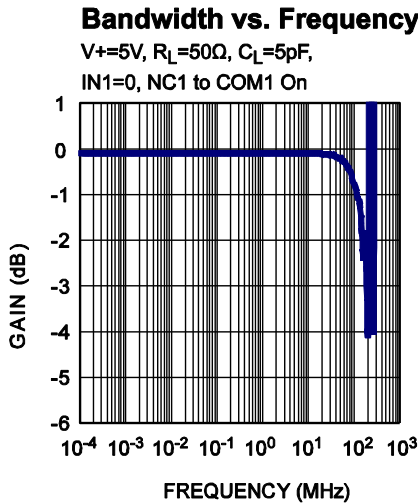
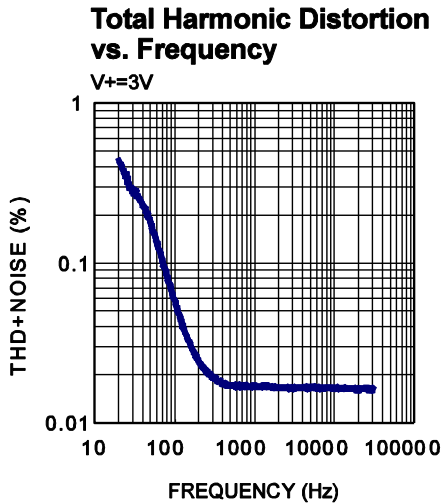
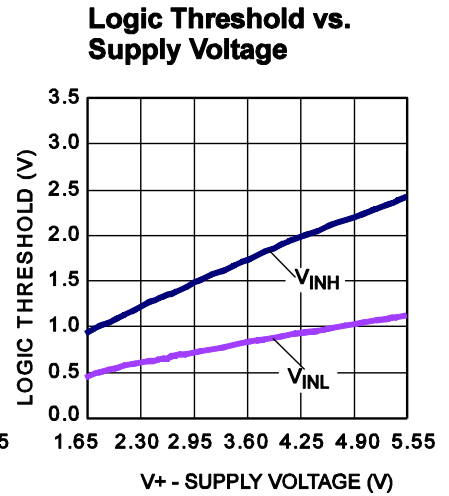
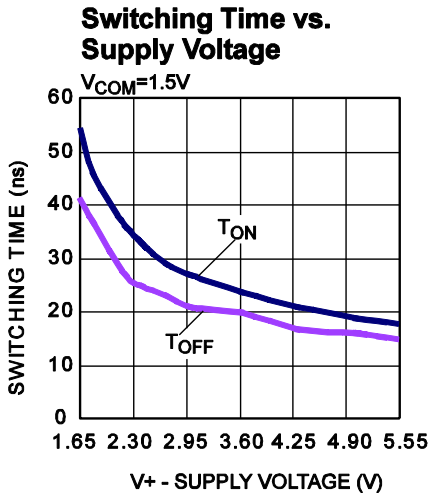
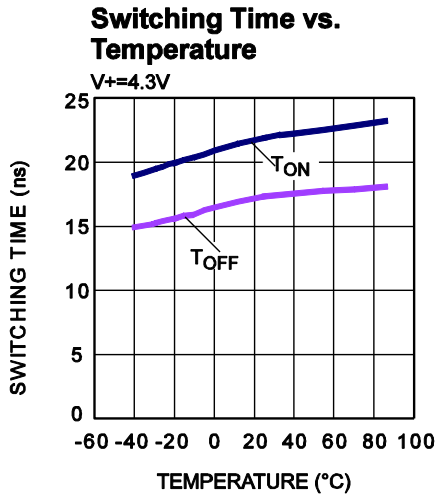
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25°C, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, unless otherwise noted.



TEST CIRCUITS

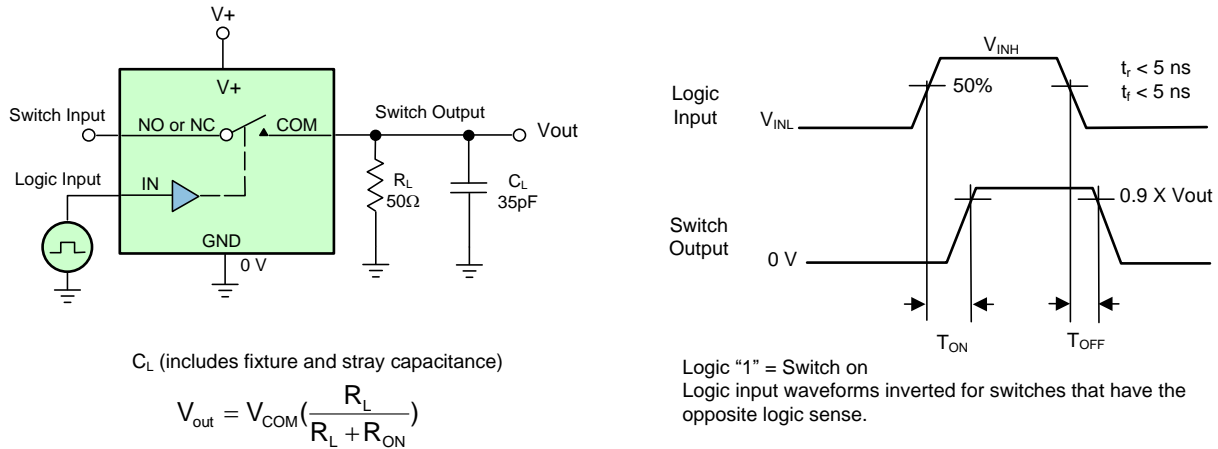


Figure 1 — Switching Time

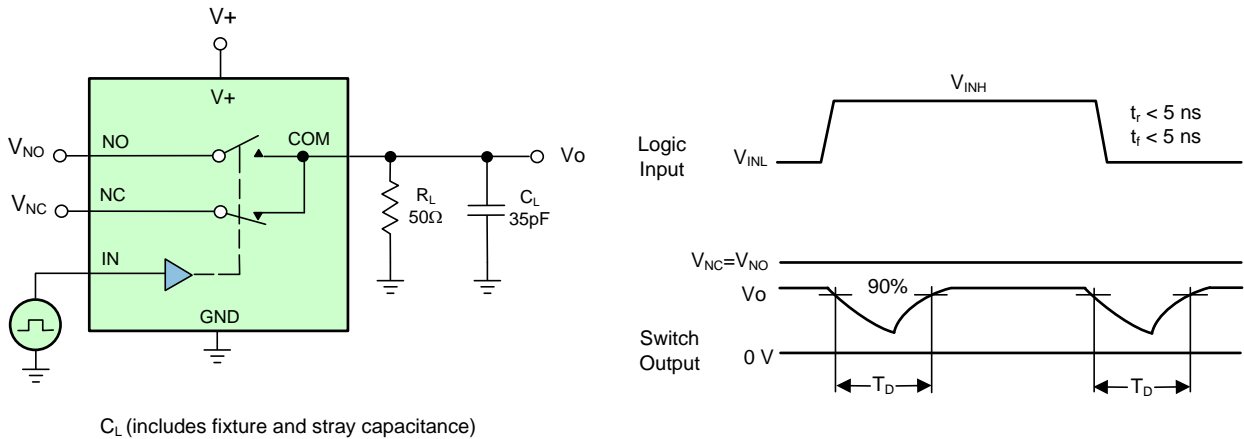


Figure 2 — Break-Before-Make Interval

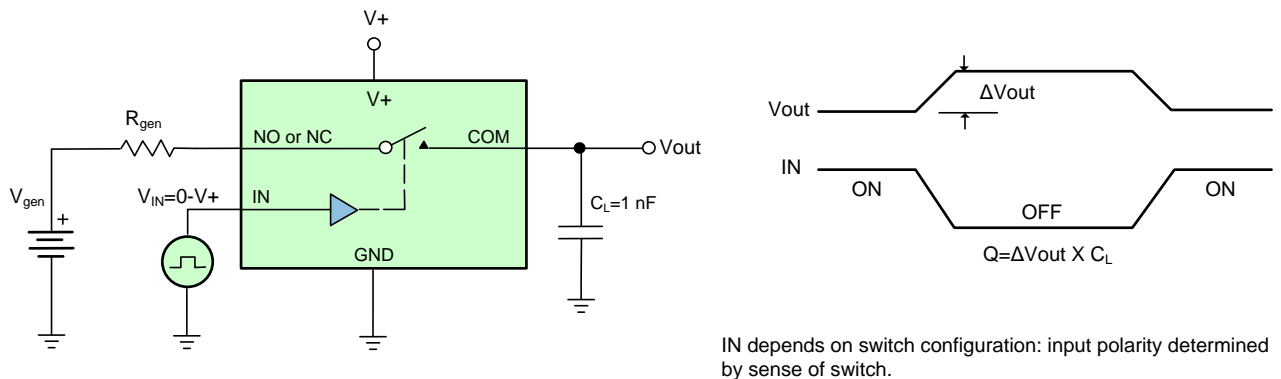


Figure 3 — Charge Injection

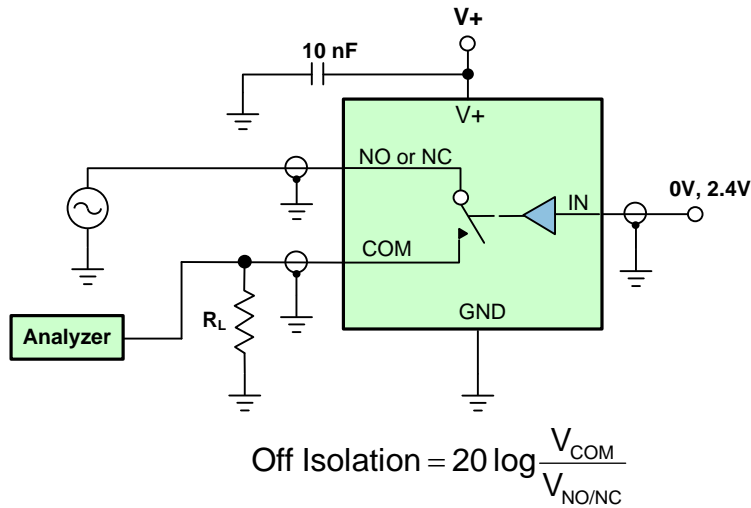


Figure 4 — Off-Isolation

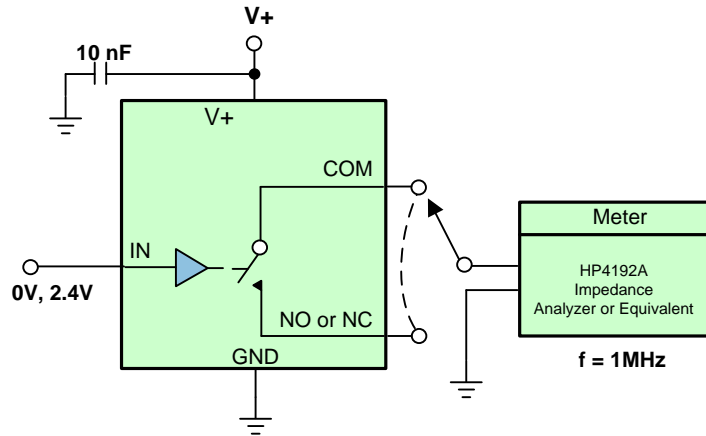


Figure 5 — Channel Off/On Capacitance