



New Product

DG2037/2038/2039

Vishay Siliconix

Low-Voltage, Low r_{ON} , Dual SPST Analog Switch

FEATURES

- Low Voltage Operation (1.8 V to 5.5 V)
- Low On-Resistance - $r_{DS(on)}$: 3.0 Ω
- Fast Switching - 12 ns
- Low Charge Injection - Q_{INJ} : 10 pC
- Low Power Consumption
- TTL/CMOS Compatible
- SOT23-8 and MSOP-8 Packages

BENEFITS

- Reduced Power Consumption
- Simple Logic Interface
- High Accuracy
- Reduce Board Space

APPLICATIONS

- Cellular Phones
- Communication Systems
- Portable Test Equipment
- Battery Operated Systems
- Sample and Hold Circuits

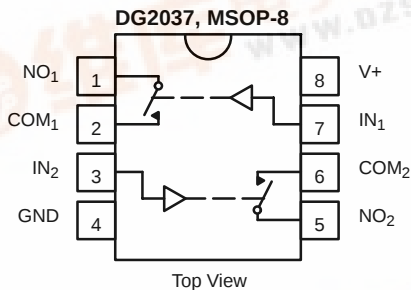
DESCRIPTION

The DG2037/2038/2039 are dual single-pole/single-throw monolithic CMOS analog switch designed for high performance switching of analog signals. Combining low power, fast switching, low on-resistance ($r_{DS(on)}$: 3.0 Ω @ 2.7 V) and small physical size, the DG2037/2038/2039 are ideal for portable and battery powered applications requiring high performance and efficient use of board space.

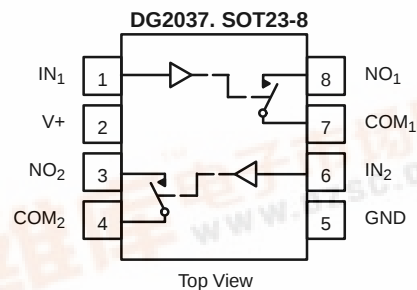
The DG2037/2038/2039 are built on Vishay Siliconix's new high density low voltage process. An epitaxial layer prevents latchup.

Each 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—DG2037



Device Marking: 2037



Device Marking: E0

TRUTH TABLE DG2037

Logic	Switch
0	Off
1	On



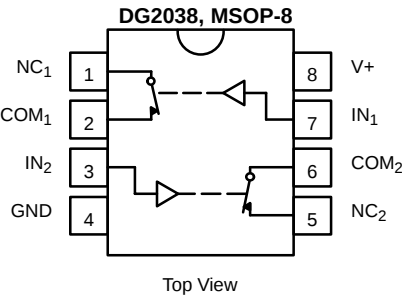
DG2037/2038/2039

Vishay Siliconix

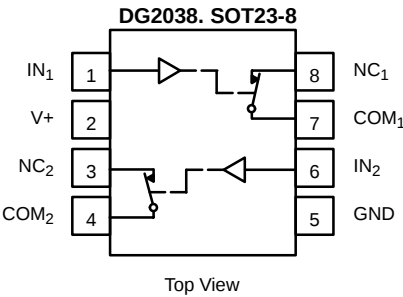
New Product



FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION—DG2038/DG2039

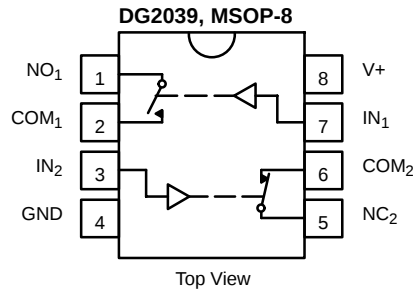


Device Marking: 2038

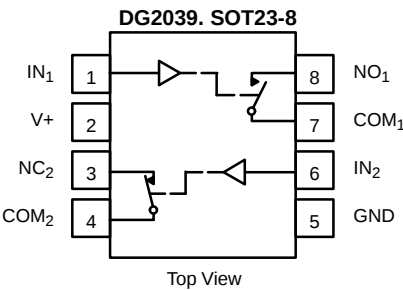


Device Marking: F1

TRUTH TABLE DG2038	
Logic	Switch
0	On
1	Off



Device Marking: 2039



Device Marking: F2

TRUTH TABLE DG2039		
Logic	Switch-1	Switch-2
0	Off	On
1	On	Off

ORDERING INFORMATION		
Temp Range	Package	Part Number
-40 to 85°C	MSOP-8	DG2037DQ
		DG2038DQ
		DG2039DQ
	SOT23-8	DG2037DS
		DG2038DS
		DG2039DS



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DG2037/2038/2039
Vishay Siliconix

ABSOLUTE MAXIMUM RATINGS

Reference to GND

V+	-0.3 to 6.0 V
IN, COM, NC, NO ^a	-0.3 V to (V ₊ + 0.3 V)
Continuous Current (Any terminal)	±50 mA
Peak Current (Pulsed at 1 ms, 10% duty cycle)	±200 mA
Storage Temperature (D Suffix)	-65 to 150°C

Power Dissipation (Packages)^b

MSOP-8 ^c	320 mW
SOT23-8 ^c	515 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 6.5 mW/°C above 25°C

SPECIFICATIONS (V₊ = 3.0 V)

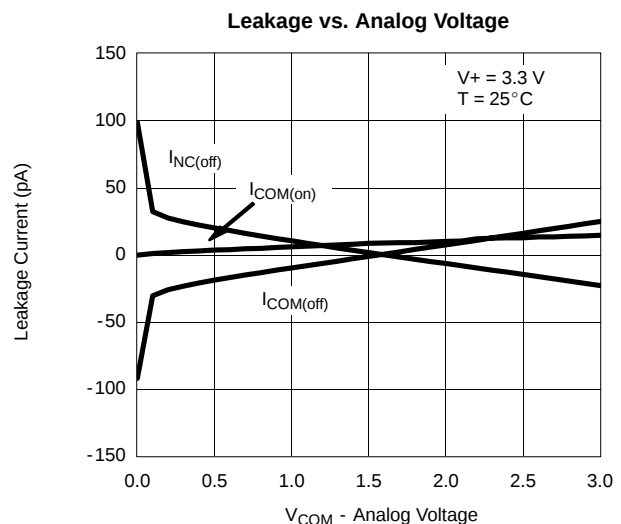
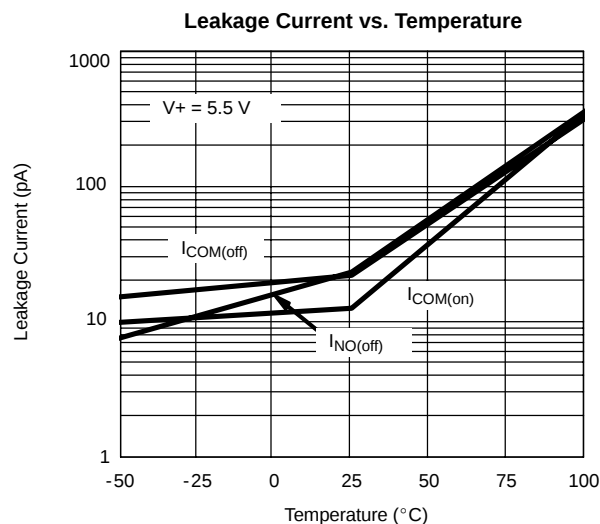
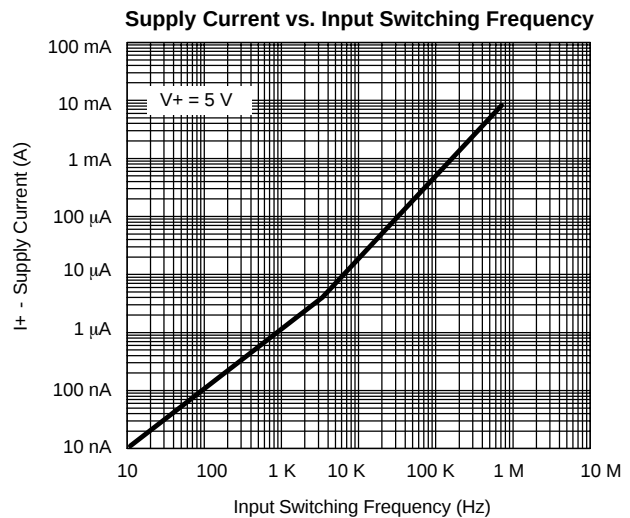
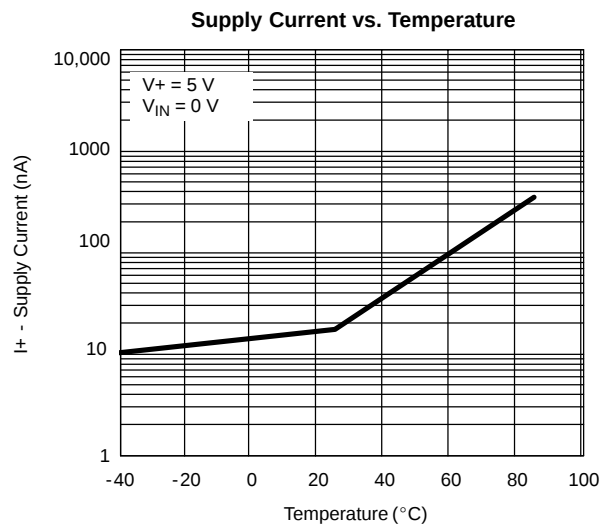
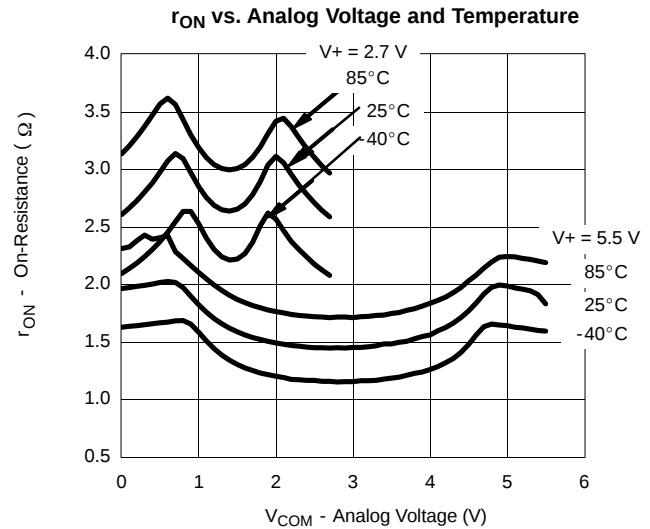
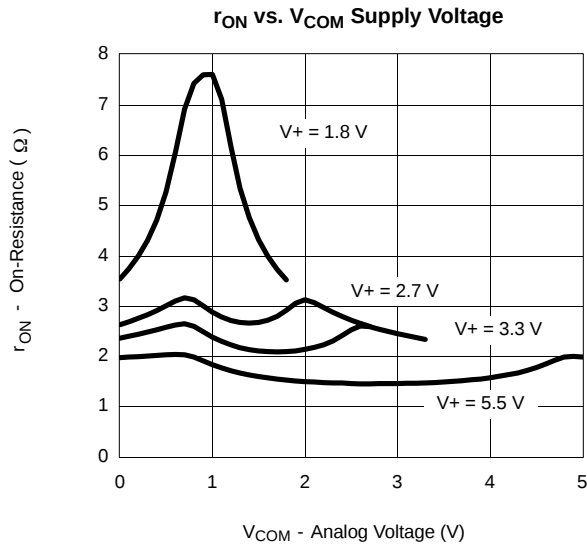
Parameter	Symbol	Test Conditions Otherwise Unless Specified V+ = 3 V, ±10%, VIN = 0.4 or 1.5 V ^e	Temp ^a	Limits -40 to 85°C			Unit
				Min ^b	Typ ^c	Max ^b	
Analog Switch							
Analog Signal Range ^d	VNO, VNC, VCOM		Full	0		V+	V
On-Resistance	rON	V+ = 2.7 V, VCOM = 1.5 V, INO, INC = 10 mA	Room Full		3	6 7	Ω
rON Flatness ^d	rON Flatness	V+ = 2.7 V, VCOM = 1.5 to V+, INO, INC = 10 mA	Room		0.5		
rON Match ^d	rON Match	V+ = 2.7 V, VD = 1.5 to V+, ID = 10 mA	Room		0.3		
Switch Off Leakage Current	INO(off), INC(off)	V+ = 3.3 V VNO, VNC = 1 V/3 V, VCOM = 3 V/1 V	Room Full	-1 -10		1 10	nA
	ICOM(off)		Room Full	-1 -10		1 10	
Channel-On Leakage Current	ICOM(on)	V+ = 3.3 V, VNO, VNC = VCOM = 1 V/3 V	Room Full	-1 -10		1 10	
Digital Control							
Input High Voltage	VINH		Full	1.5			V
Input Low Voltage	VINL		Full			0.4	
Input Capacitance ^d	Cin	f = 1 MHz	Full		8		pF
Input Current	IINL or IINH	VIN = 0 or V+	Full	-1		1	μA
Dynamic Characteristics							
Turn-On Time	tON	VNO or VNC = 2.0 V, RL = 300 Ω, CL = 35 pF Figure 1 and 2	Room Full		22	35 40	ns
Turn-Off Time	tOFF		Room Full		17	31 35	
Charge Injection ^d	QINJ	CL = 1 nF, VGEN = 0 V, RGEN = 0 Ω, Figure 3	Room		1		pC
Off-Isolation ^d	OIRR	RL = 50 Ω, CL = 5 pF, f = 1 MHz	Room		-61		dB
Crosstalk ^d	XTALK		Room		-67		
Source-Off Capacitance ^d	CNC/NO(off)	VIN = 0 or V+, f = 1 MHz	Room		17		pF
Drain-Off Capacitance ^d	CCOM(off)		Room		19		
Channel-On Capacitance ^d	CON		Room		35		
Power Supply							
Power Supply Range	V+			2.7		3.3	V
Power Supply Current	I+	VIN = 0 or V+			0.02	1.0	μA
Power Consumption	PC					3.3	μW



SPECIFICATIONS (V+ = 5.0 V)							
Parameter	Symbol	Test Conditions Otherwise Unless Specified V+ = 5 V, ±10%, VIN = 0.8 or 2.4 V ^e	Temp ^a	Limits -40 to 85°C			Unit
				Min ^b	Typ ^c	Max ^b	
Analog Switch							
Analog Signal Range ^d	VNO, VNC, VCOM		Full	0		V+	V
On-Resistance	rON	V+ = 4.5 V, VCOM = 2.5 V, INO, INC = 10 mA	Room Full		2.5 1.6	5 6	Ω
rON Flatness ^d	rON Flatness	V+ = 4.5 V, VCOM = 2.5 to V+, INO, INC = 10 mA	Room		0.4		
rON Match ^d	rON Match	V+ = 4.5 V, ID = 10 mA, VCOM = 2.5 V	Room		0.2		
Switch Off Leakage Current ^f	INO(off), INC(off)	V+ = 5.5 V VNO, VNC = 1 V/4.5 V, VCOM = 4.5 V/1 V	Room Full	-1 -10		1 10	nA
	ICOM(off)		Room Full	-1 10		1 10	
Channel-On Leakage Current ^f	ICOM(on)	V+ = 5.5 V VNO, VNC = VCOM = 1 V/4.5 V	Room Full	-1 -10		1 10	
Digital Control							
Input High Voltage	VINH		Full	2.4			V
Input Low Voltage	VINL		Full			0.8	
Input Capacitance	Cin	f = 1 MHz	Full		8		pF
Input Current	IINL or IINH	VIN = 0 or V+	Full	-1		1	μA
Dynamic Characteristics							
Turn-On Time ^d	tON	VNO or VNC = 3 V, RL = 300 Ω, CL = 35 pF Figure 1 and 2	Room Full		19	30 35	ns
Turn-Off Time ^d	tOFF		Room Full		12	22 30	
Charge Injection ^d	QINJ	CL = 1 nF, VGEN = 0 V, RGEN = 0 Ω, Figure 3	Room		1		pC
Off-Isolation ^d	OIRR	RL = 50 Ω, CL = 5 pF, f = 1 MHz	Room		-61		dB
Crosstalk ^d	XTALK		Room		-67		
Source-Off Capacitance ^d	CNC/NO(off)	VIN = 0 or V+, f = 1 MHz	Room		15		pF
Drain-Off Capacitance ^d	CCOM(off)		Room		17		
Channel-On Capacitance ^d	CON		Room		35		
Power Supply							
Power Supply Range	V+			4.5		5.5	V
Power Supply Current	I+	VIN = 0 or V+			0.02	1.0	μA
Power Consumption	PC					5.5	μW

Notes:

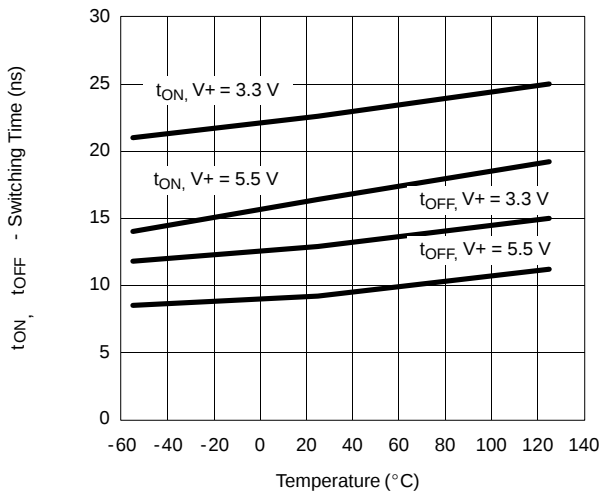
- Room = 25°C, Full = as determined by the operating suffix.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Typical values are for design aid only, not guaranteed nor subject to production testing.
- Guarantee by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

**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

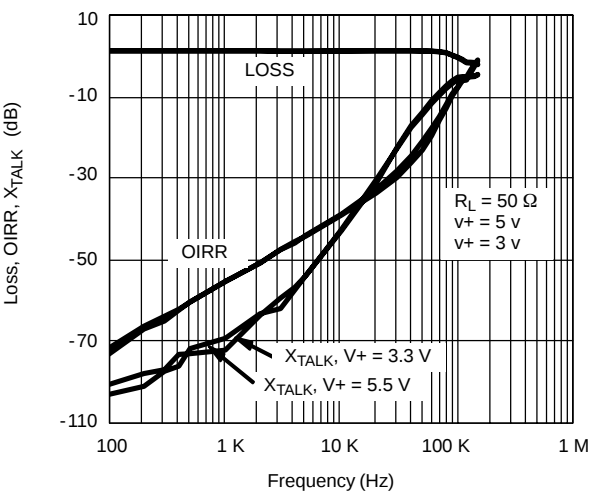


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

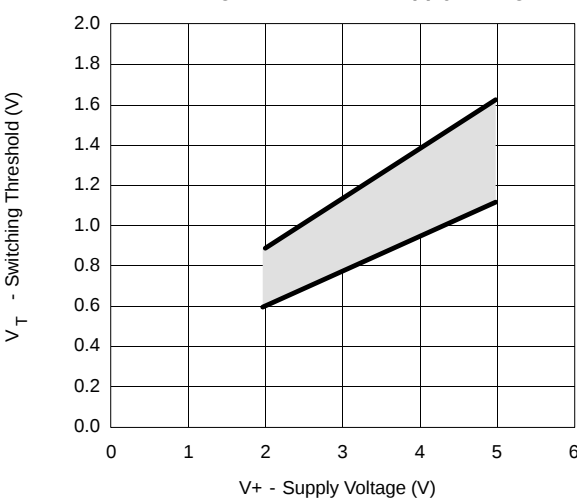
Switching Time vs. Temperature and Supply Voltage



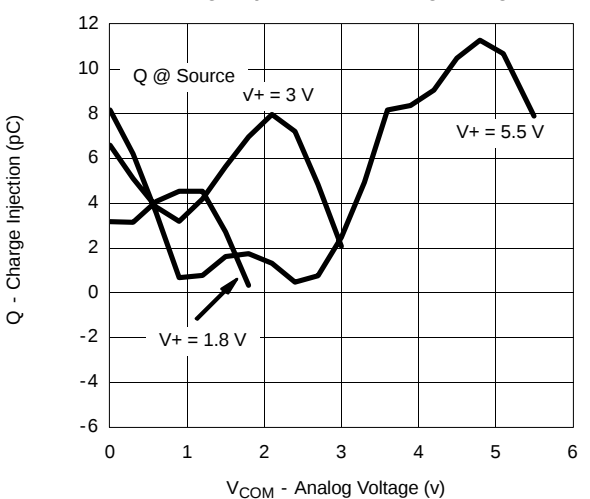
Insertion Loss, Off-Isolation, Crosstalk vs. Frequency



Switching Threshold vs. Supply Voltage

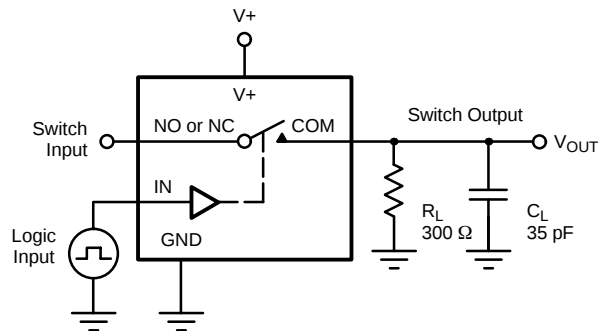


Charge Injection vs. Analog Voltage



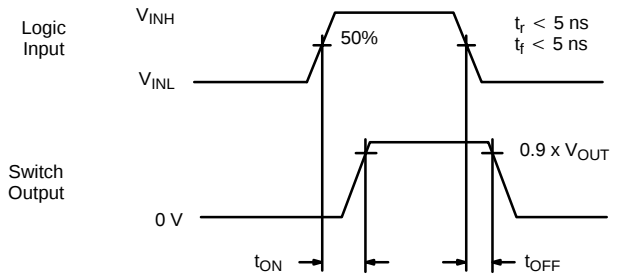


TEST CIRCUITS



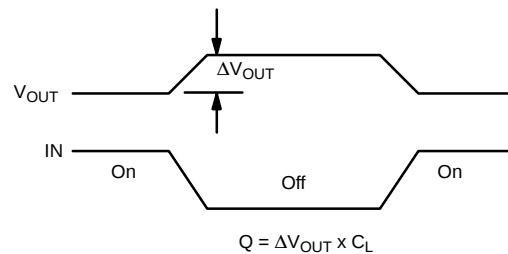
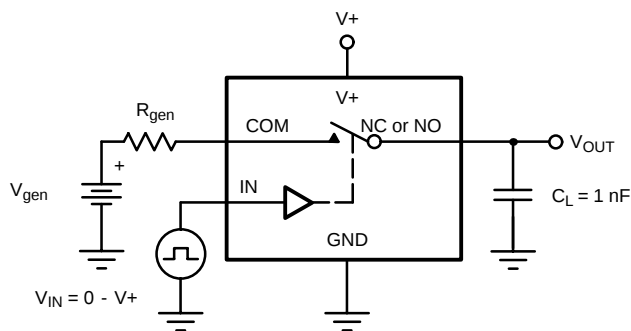
C_L (includes fixture and stray capacitance)

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



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

FIGURE 1. Switching Time



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

FIGURE 2. Charge Injection

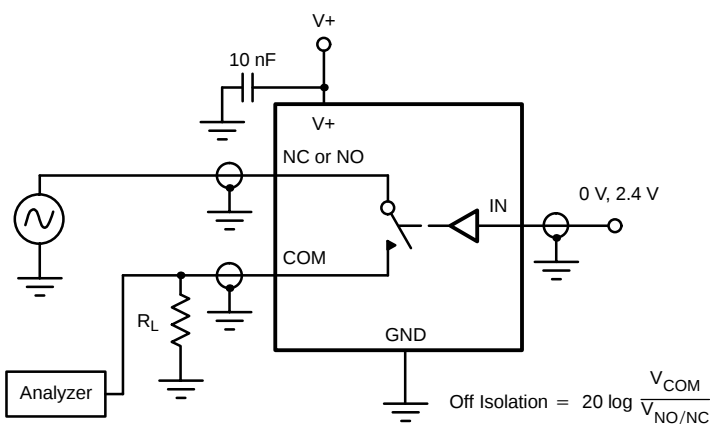


FIGURE 3. Off-Isolation

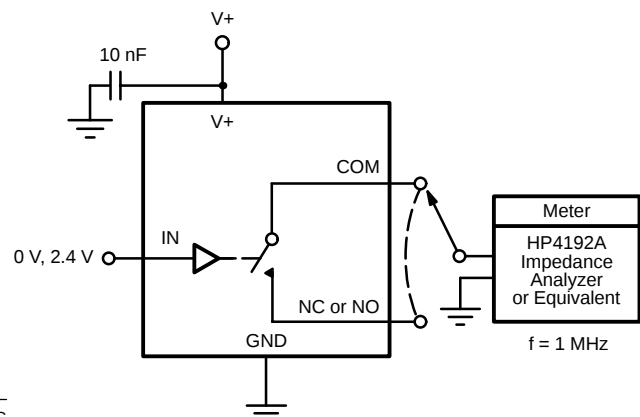


FIGURE 4. Channel Off/On Capacitance