



Low-Voltage Single Asymmetrical SPDT Analog Switch

FEATURES

- Low Voltage Operation (2.7 V to 5.5 V)
- Low On-Resistance - r_{ON}
 - NO = $0.8\ \Omega$
 - NC = $1.2\ \Omega$
- Low Power Consumption
- TTL/CMOS Compatible
- TSOP-6 Package

BENEFITS

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

APPLICATIONS

- Cellular Phones
- Communication Systems
- Portable Test Equipment
- Battery Operated Systems

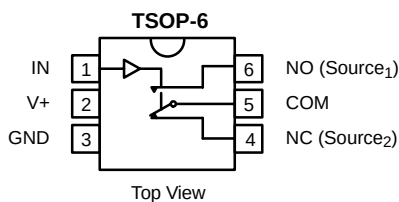
DESCRIPTION

The DG2020 is a single-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 DG2020 is ideal for portable and battery powered applications requiring high performance and efficient use of board space.

The DG2020 is built on Vishay Siliconix's low voltage J12 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



Device Marking: E3xxx

TRUTH TABLE

Logic	NC	NO
0	ON	OFF
1	OFF	ON

ORDERING INFORMATION

Temp Range	Package	Part Number
-40 to 85°C	TSOP-6	DG2020DV

ABSOLUTE MAXIMUM RATINGS

Reference to GND

V+ -0.3 to +6 V

IN, COM, NC, NO^a -0.3 to (V+ + 0.3 V)

Continuous Current (Any terminal) ±50 mA

Peak Current ±200 mA

(Pulsed at 1 ms, 10% duty cycle)

Storage Temperature (D Suffix) -65 to 125°C

Power Dissipation (Packages)^bTSOP-6^c 570 mW

Notes:

a. Signals on NC, NO, or COM or IN exceeding 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 7.0 mW/°C above 25°C

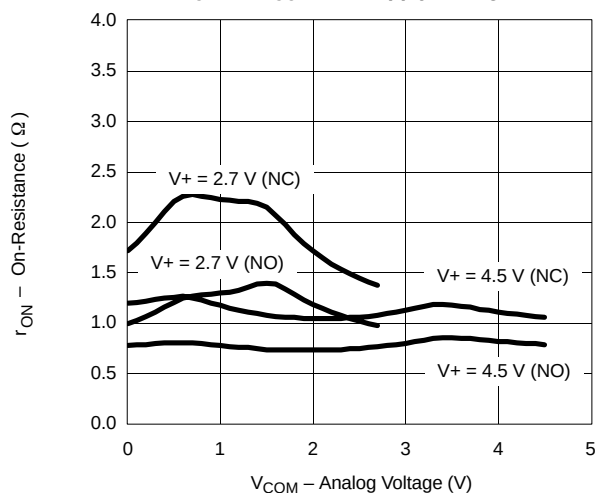
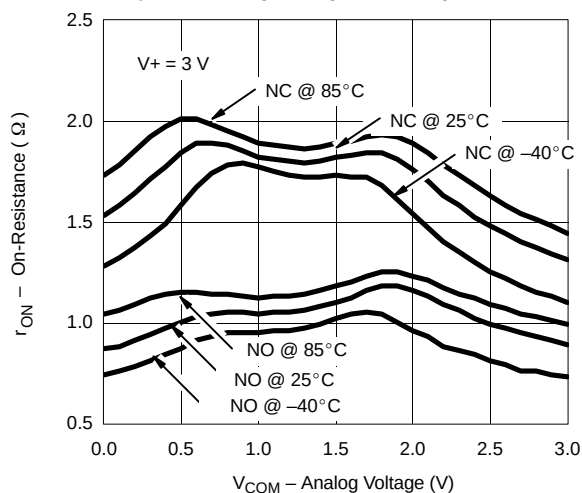
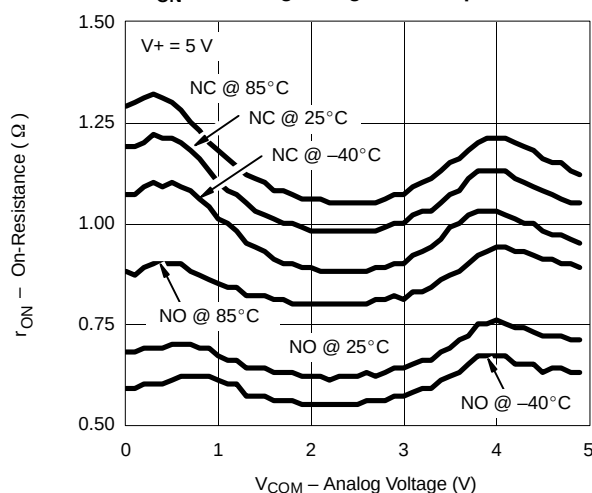
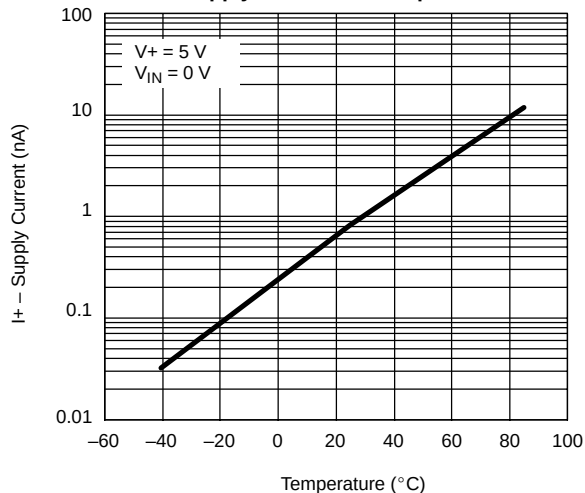
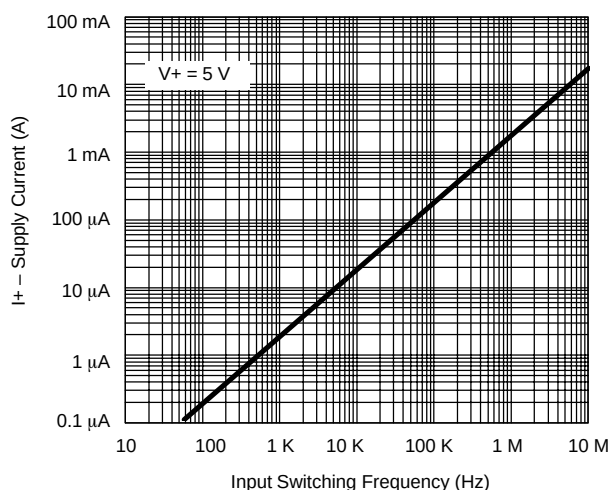
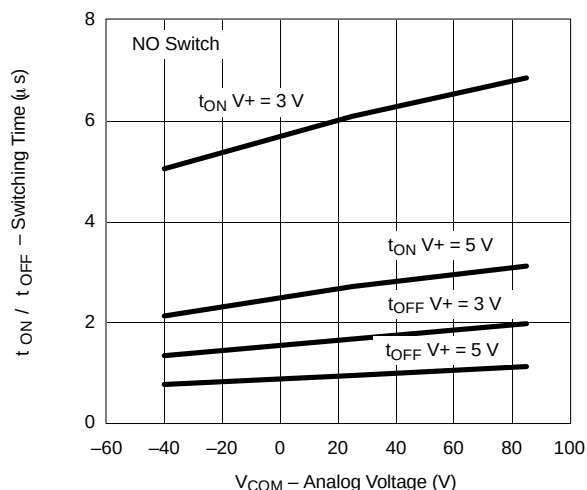
SPECIFICATIONS (V+ = 3 V)							
Parameter	Symbol	Test Conditions Otherwise Unless Specified V+ = 3 V, ±10%, VIN = 0.4 or 2.0 V ^e	Temp ^a	Limits −40 to 85°C			Unit
				Min ^b	Typ ^c	Max ^b	
Analog Switch							
Analog Signal Range ^d	VNO, VNC, VCOM		Full	0		V+	V
On-Resistance	rON(NO)	V+ = 2.7 V, VCOM = 1.5 V, INO, INC = 100 mA	Room		1.4	2.0	Ω
	rON(NC)		Full		1.5	2.1	
rON Flatness ^d	rON(NO) Flatness	V+ = 2.7 V VCOM = 0 to V+, INO, INC = 100 mA	Room		0.42		
Switch Off Leakage Current ^f	INO(off), INC(off)	V+ = 3.3 V, VNO, VNC = 1 V/3 V VCOM = 3 V/1 V	Room	−2.3		2.3	nA
	ICOM(off)		Full	−60		60	
Channel-On Leakage Current ^f	ICOM(on)	V+ = 3.3 V, VNO, VNC = VCOM = 1 V/3 V	Room	−2.3		2.3	
			Full	−60		60	
Digital Control							
Input High Voltage	VINH		Full	2			V
Input Low Voltage	VINL		Full			0.4	
Input Capacitance	Cin		Full		3.7		pF
Input Current	IINL or IINH	VIN = 0 or V+	Full	1		1	μA
Dynamic Characteristics							
Turn-On Time	tON(NO)	VNO or VNC = 2.0 V, RL = 300 Ω, CL = 35 pF	Room		6	10	μs
	tON(NC)		Full		5	7	
Turn-Off Time	tOFF(NO)		Room		2	5	
	tOFF(NC)		Room		2	4	
Break-Before-Make Time	td	VNO or VNC = 2.0 V, RL = 300 Ω, CL = 35 pF	Full	1	3		
Charge Injection ^d	QINJ	CL = 1 nF, VGEN = 0 V, RGEN = 0 Ω	Room		1		pC
Off-Isolation ^d	OIRR	RL = 50 Ω, CL = 5 pF, f = 1 MHz	Room		−52		dB
Crosstalk ^d	XTALK		Room		−53		
NO, NC Off Capacitance ^d	CNO(off)	VIN = 0 or V+, f = 1 MHz	Room		75		pF
	CNC(off)		Room		34		
Channel-On Capacitance ^d	CNO(on)		Room		88		
	CNC(on)		Room		95		
Power Supply							
Power Supply Range	V+			2.7		3.3	V
Power Supply Current	I+	VIN = 0 or V+	Full		0.2	1.0	μA
Power Consumption	PC		Full			3.3	μW



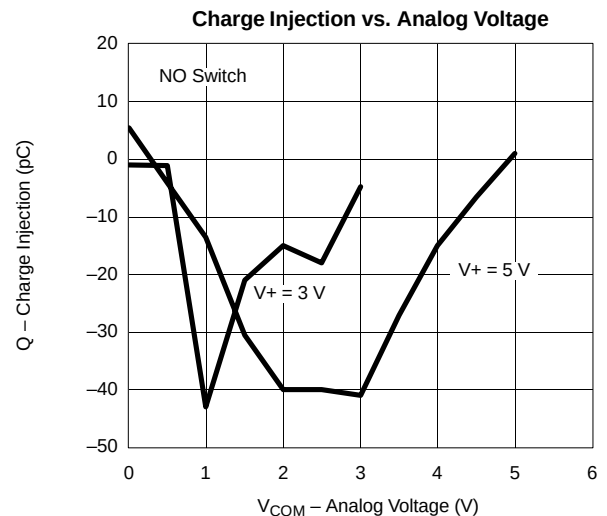
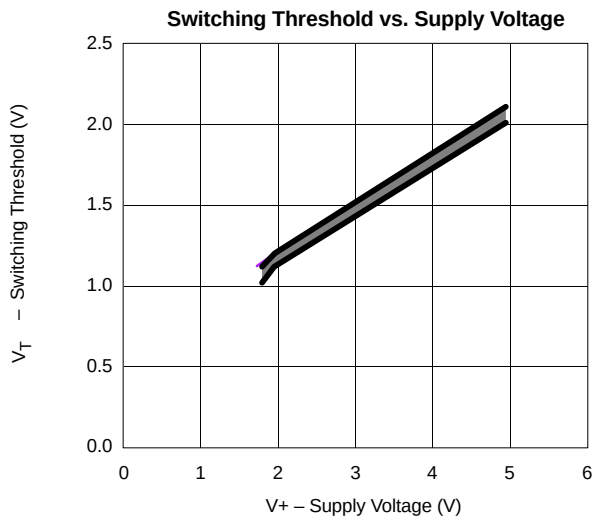
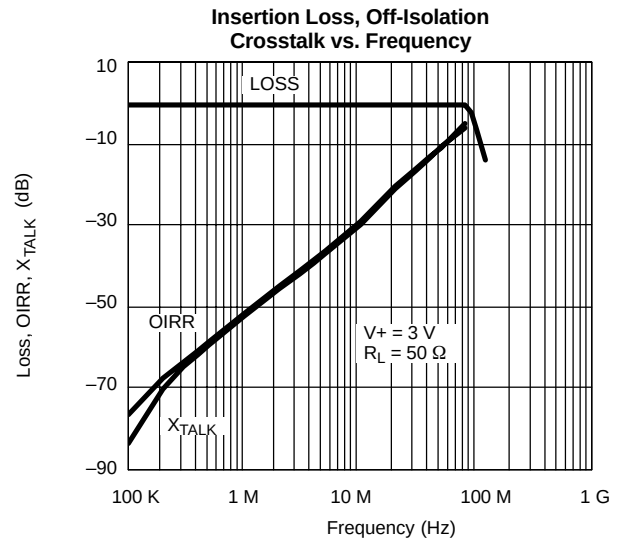
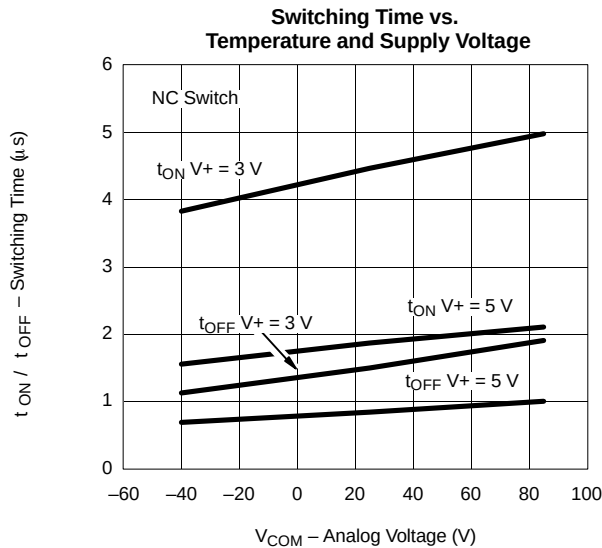
SPECIFICATIONS (V+ = 5 V)							
Parameter	Symbol	Test Conditions Otherwise Unless Specified V+ = 5 V, ±10%, VIN = 0.8 or 2.4 V ^e	Temp ^a	Limits –40 to 85°C			Unit
				Min ^b	Typ ^c	Max ^b	
Analog Switch							
Analog Signal Ranged ^d	VNO, VNC, VCOM		Full	0		V+	V
On-Resistance	rON(NO)	V+ = 4.5 V, VCOM = 3 V, INO, INC = 100 mA	Room Full		0.8 0.9	1.1 1.2	Ω
	rON(NC)		Room Full		1.2 1.3	1.6 1.7	
rON Flatness ^d	rON(NO) Flatness	V+ = 4.5 V, VCOM = 0 to V+, INO, INC = 100 mA	Room		0.13		
Switch Off Leakage Current	INO(off), INC(off)	V+ = 5.5 V VNO, VNC = 1 V/4.5 V, VCOM = 4.5 V/1 V	Room Full	–5.3 –98		5.3 98	nA
	ICOM(off)		Room Full	–5.3 –98		5.3 98	
Channel-On Leakage Current	ICOM(on)	V+ = 5.5 V, VNO, VNC = VCOM = 1 V/4.5 V	Room Full	–5.3 –98		5.3 98	
Digital Control							
Input High Voltage	VINH		Full	2.4			V
Input Low Voltage	VINL		Full			0.8	
Input Capacitance	Cin		Full		3.5		pF
Input Current	IINL or IINH	VIN = 0 or V+	Full	1		1	μA
Dynamic Characteristics							
Turn-On Time	tON(NO)	VNO or VNC = 3 V, RL = 300 Ω, CL = 35 pF	Room Full		3	6 6.5	μs
	tON(NC)		Room Full		2	5 5.5	
Turn-Off Time	tOFF(NO)		Room Full		1	4 4.5	
	tOFF(NC)		Room Full		1	3 3.5	
Break-Before-Make Time	td	VNO or VNC = 3 V, RL = 300 Ω, CL = 35 pF	Full	0.3	1.5		
Charge Injection ^d	QINJ	CL = 1 nF, VGEN = 0 V, RGEN = 0 Ω	Room		5		pC
Off-Isolation ^d	OIRR	RL = 50 Ω, CL = 5 pF, f = 1 MHz	Room		–53		dB
Crosstalk ^d	XTALK		Room		–54		
Source-Off Capacitance ^d	CNO(off)	VIN = 0 or V+, f = 1 MHz	Room		65		pF
	CNC(off)		Room		32		
Channel-On Capacitance ^d	CNO(on)		Room		90		
	CNC(on)		Room		95		
Power Supply							
Power Supply Range	V+			4.5		5.5	V
Power Supply Current	I+	VIN = 0 or V+	Full		0.2	1.0	μA
Power Consumption	PC		Full			5.5	μW

Notes:

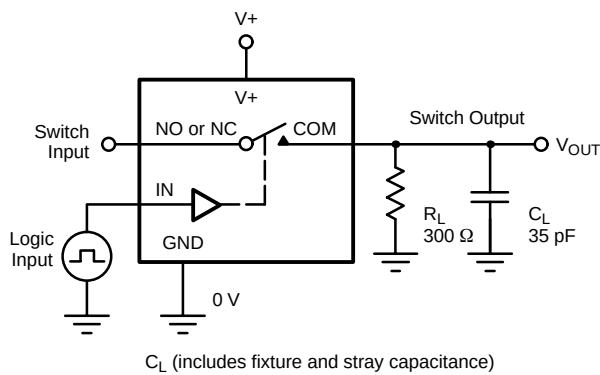
- Room = 25°C, Full = as determined by the operating suffix.
- Typical values are for design aid only, not guaranteed nor subject to production testing.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Guarantee by 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

 r_{ON} vs. Analog Voltage and Temperature

Supply Current vs. Temperature

Supply Current vs. Input Switching Frequency

Switching Time vs. Temperature and Supply Voltage


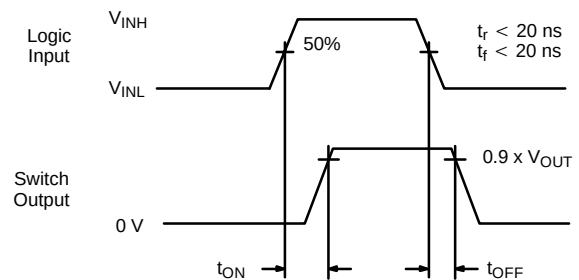
TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



TEST CIRCUITS



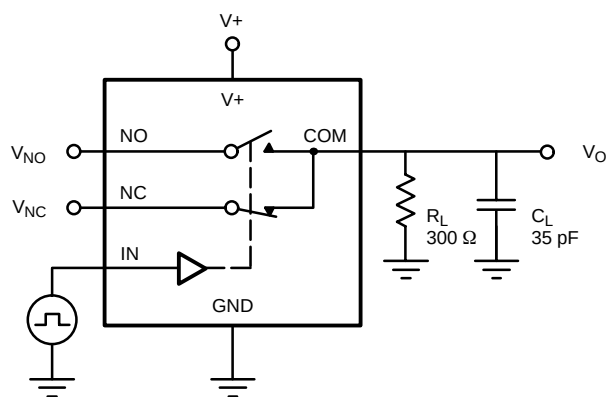
$$V_{OUT} = V_{COM} \left(\frac{R_L}{R_L + R_{ON}} \right)$$



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)

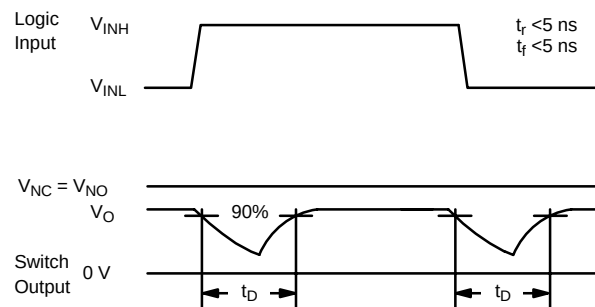
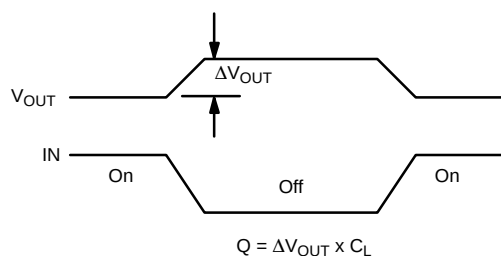
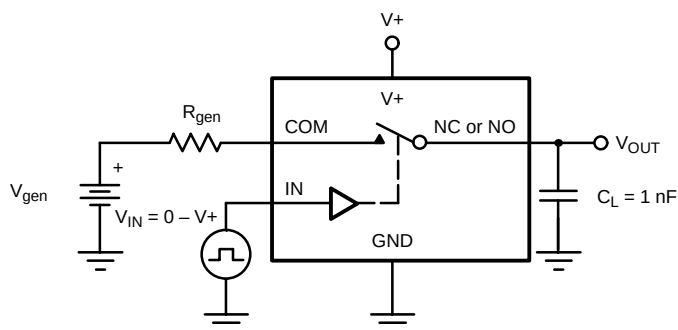


FIGURE 5. Break-Before-Make Interval



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

FIGURE 2. Charge Injection

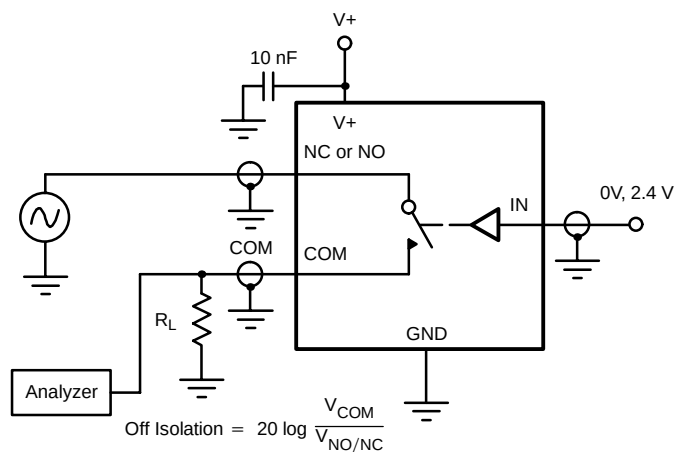


FIGURE 3. Off-Isolation

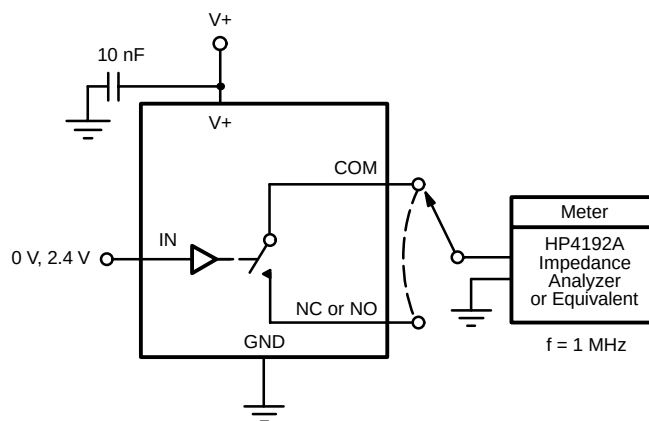


FIGURE 4. Channel Off/On Capacitance