Single 4:1 Low r_{ON} Multiplexers

DESCRIPTION

The DG2034 is a low voltage, low r_{ON}, high bandwidth single 4 to 1 analog multiplexer designed for high performance switching of analog and video signals. Combining low power; fast switching; low on-resistance, flatness and matching; and small physical size, the DG2034 is ideal for portable and battery applications.

Built on Vishay Siliconix's low voltage CMOS process, the DG2034 has an epitaxial layer which prevents latchup. Break-before-make is guaranteed.

FEATURES

- Low voltage operation (1.8 V to 5.5 V)
- Low on-resistance - $r_{DS(on)}$: 4 Ω
- Off-isolation and crosstalk: - 55 dB at 10 MHz
- Fast switch - 25 ns t_{ON}
- Low charge injection - Q_{INJ}: 4.7 pC
- Low power consumption - 4 µW

Pb-free
RoHS COMPLIANT

BENEFITS

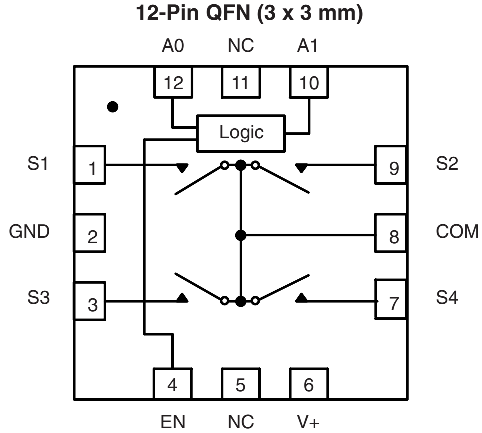
- High accuracy
- High bandwidth
- TTL and low voltage logic compatibility
- Low power consumption
- Reduced PCB space

APPLICATIONS

- Mixed signal routing
- Portable and battery operated systems
- Low voltage data acquisition
- Modems
- PCMCIA cards

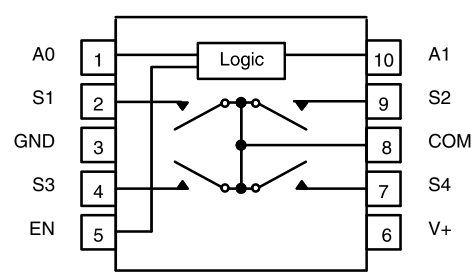
FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

12-Pin QFN (3 x 3 mm)



Top View

MSOP-10



Top View

TRUTH TABLE

A1	A0	EN	ON Switch
X	X	0	None
0	0	1	S1
0	1	1	S2
1	0	1	S3
1	1	1	S4

ORDERING INFORMATION

Temp Range	Package	Part Number
- 40 °C to 85 °C	MSOP-10	DG2034DQ-T1-E3
	12-pin QFN (3 x 3 mm)	DG2034DN-T1-E4

ABSOLUTE MAXIMUM RATINGS			
Parameter		**Limit**	**Unit**
Referenced V+ to GND		- 0.3 to + 6	V
A_X, E_N, S_X, COM[a]		- 0.3 to (V+ + 0.3)	
Continuous Current (Any Terminal)		± 50	mA
Peak Current (Pulsed at 1 ms, 10 % duty cycle)		± 100	
Power Dissipation (Packags)[b]	QFN-12 (3 x 3 mm)[c]	1295	mW
	MSOP-10[d]	320	
Storage Temperature (D Suffix)		- 65 to 150	°C

Notes:
a. Signals on S_X, D_X, EN or A_X 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 16.2 mV/°C above 70 °C.
d. Derate 4.0 mV/°C above 70 °C.

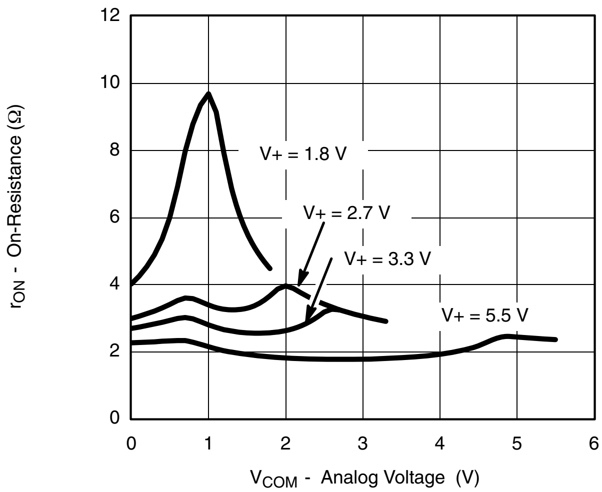
SPECIFICATIONS (V+ = 3 V)								
Parameter	**Symbol**	**Test Conditions Otherwise Unless Specified** V+ = 3 V, ± 10 %, V_{AL} = 0.4 V, V_{AH} = 1.5 V[e]		**Temp.**[a]	**Limits - 40 to 85 °C** **Min.**[c]	**Typ.**[b]	**Max.**[c]	**Unit**
Analog Switch								
Analog Signal Range[d]	V_{ANALOG}			Full	0		V+	V
On-Resistance	r_{ON}	V+ = 2.7 V, V_{COM} = 0.5 V/1.5 V/2.0 V, I_S = 10 mA		Room Full		4	7 9	Ω
r_{ON} Match	Δr_{ON}			Room		0.1	0.3	
r_{ON} Flatness[d,f]	r_{ON} Flatness			Room		0.3	1.5	
Off Leakage Current[g]	$I_{S(off)}$	V+ = 3.3 V, V_S = 1 V/3 V, V_{COM} = 3 V/1 V, V_{EN} = 0 V		Room Full	- 1 - 10	0.3	1 10	nA
COM Off Leakage Current[g]	$I_{COM(off)}$			Room Full	- 1 - 10	0.3	1 10	
Channel-On Leakage Current[g]	$I_{COM(on)}$	V+ = 3.3 V, V_{COM} = V_S = 1 V/3 V		Room Full	- 1 - 10	0.3	1 10	
Digital Control								
Input Current[d]	I_A or I_{EN}	$V_{A/EN}$ = 0 or V+, See Truth Table		Full	- 1.0		1.0	µA
Input High Voltage[d]	V_{AH} or V_{ENH}			Full	1.5			V
Input Low Voltage[d]	V_{AL} or V_{ENL}			Full			0.4	
Dynamic Characteristics								
Turn-On Time	t_{ON}	V_S = 1.5 V, R_L = 300 Ω		Room Full		25	35 45	ns
Turn-Off Time	t_{OFF}			Room Full		15	25 35	
Break-Before-Make Time[d]	t_D			Room		10.5		
Transition Time	t_{trans}	V_S = 1.5 V/0 V, V_S = 0 V/1.5 V, R_L = 300 Ω		Room Full		30	45 55	
Charge Injection[d]	Q_{INJ}	C_L = 1 nF, V_{gen} = 0 V, R_{gen} = 0 Ω		Room		- 4.7		pC
Off-Isolation[d]	OIRR	R_L = 50 Ω, C_L = 5 pF	f = 1 MHz	Room		- 73		dB
			f = 10 MHz	Room		- 54		
Channel-to-Channel Crosstalk[d]	X_{TALK}	R_L = 50 Ω, C_L = 5 pF	f = 1 MHz	Room		- 77		
			f = 10 MHz	Room		- 59		
Off Capacitance[d]	$C_{S(off)}$	V+ = 2.7 V, f = 1 MHz		Room		14		pF
COM Off Capacitance[d]	$C_{COM(off)}$			Room		46		
COM On Capacitance[d]	$C_{COM(on)}$			Room		67		
Power Supply								
Power Supply Range	V+				2.7		3.3	V
Power Supply Current[d]	I+	V+ = 3.3 V, $V_{A/EN}$ = 0 or 3.3 V, See Truth Table		Full			1.0	µA

SPECIFICATIONS (V+ = 5 V)								
Parameter	**Symbol**	**Test Conditions Otherwise Unless Specified** V+ = 3 V, ± 10 %, V_{AL} = 0.8 V or V_{AH} = 2.4 V[e]		**Temp.**[a]	**Limits** - 40 to 85 °C **Min.**[c]	**Typ.**[b]	**Max.**[c]	**Unit**
Analog Switch								
Analog Signal Range[d]	V_{ANALOG}			Full	0		V+	V
On-Resistance	r_{ON}	V+ = 4.5 V, V_{COM} = 1.5 V/2.5 V/3.5 V I_S = 10 mA		Room Full		3	5.5 7	Ω
r_{ON} Match	Δr_{ON}			Room		0.16	0.5	
r_{ON} Flatness[d,f]	r_{ON} Flatness			Room		0.6	1.5	
Off Leakage Current	$I_{S(off)}$	V+ = 5.5 V, V_S = 1 V/4.5 V V_{COM} = 4.5 V/1 V, V_{EN} = 0 V		Room Full	- 1 - 10	0.5	1 10	nA
COM Off Leakage Current	$I_{COM(off)}$			Room Full	- 1 - 10	0.5	1 10	
Channel-On Leakage Current	$I_{COM(on)}$	V+ = 5.5 V, V_{COM} = V_S = 1 V/4.5 V		Room Full	- 1 - 10	0.5	1 10	
Digital Control								
Input Current[d]	I_{AH} or I_{ENH}	V_A or V_{EN} = 0 or V+, See Truth Table		Full	- 1.0		1.0	µA
Input High Voltage[d]	V_{AH} or V_{ENH}			Full	2.4			V
Input Low Voltage[d]	V_{AL} or V_{ENL}			Full			0.8	
Dynamic Characteristics								
Turn-On Time	t_{ON}	V_S = 3.0 V, R_L = 300 Ω		Room Full		18	30 40	ns
Turn-Off Time	t_{OFF}			Room Full		12	20 30	
Break-Before-Make Time[d]	t_D			Room		10.5		
Transition Time	t_{trans}	V_S = 3 V/0 V, V_S = 0 V/3 V, R_L = 300 Ω		Room Full		25	40 50	
Off-Isolation[d]	OIRR	R_L = 50 Ω, C_L = 5 p	f = 1 MHz	Room		- 73		dB
			f = 10 MHz	Room		- 53.5		
Channel-to-Channel Crosstalk[d]	X_{TALK}	R_L = 50 Ω, C_L = 5 pF	f = 1 MHz	Room		- 77		
			f = 10 MHz	Room		- 60.2		
Charge Injection[d]	Q_{INJ}	C_L = 1 nF, V_{gen} = 0 V, R_{gen} = 0 Ω		Room		- 4.4		pC
Off Capacitance[d]	$C_{S(off)}$	V+ = 5 V, f = 1 MHz		Room		13		pF
COM Off Capacitance[d]	$C_{COM(off)}$			Room		43		
COM On Capacitance[d]	$C_{COM(on)}$			Room		64		
Power Supply								
Power Supply Range	V+				4.5		5.5	V
Power Supply Current	I+	V+ = 5.5 V, $V_{A/EN}$ = 0 or 5.5 V, See Truth Table		Full			1.0	µA

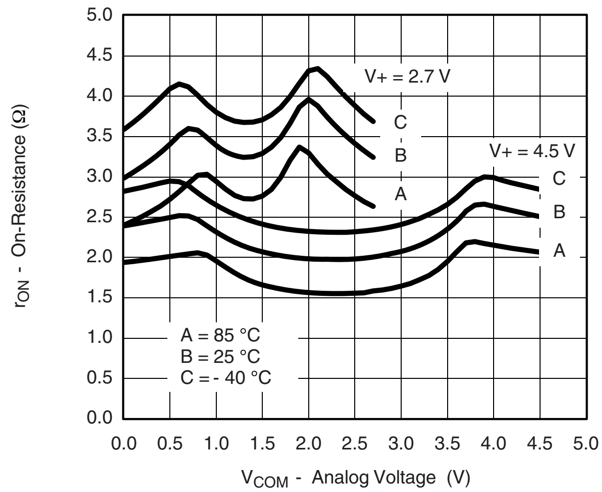
Notes:
a. Room = 25 °C, Full = as determined by the operating suffix.
b. Typical values are for design aid only, not guaranteed nor subject to production testing.
c. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
d. Guarantee by design, not subjected to production test.
e. V_A, E_N = input voltage to perform proper function.
f. Difference of min and max values.
g. Guaranteed by 5 V testing.

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.

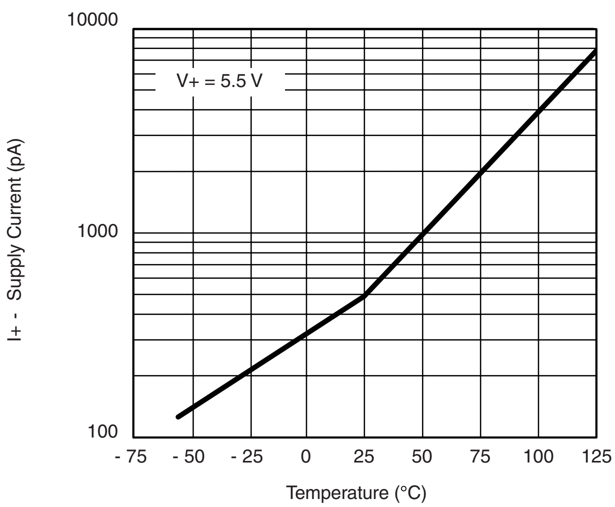
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



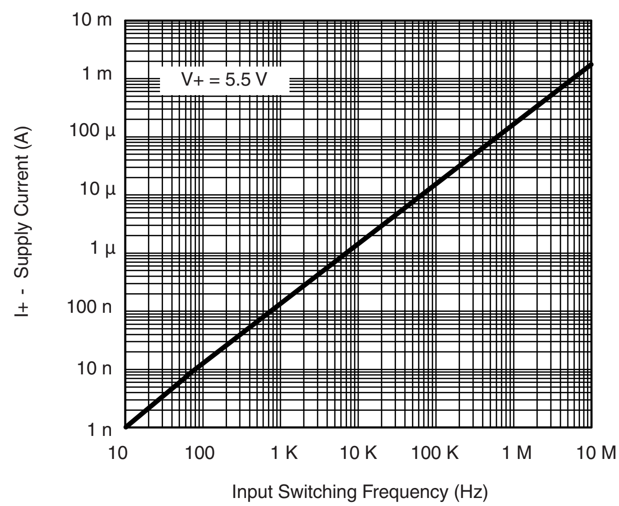
r_{ON} vs. V_{COM} and Supply Voltage



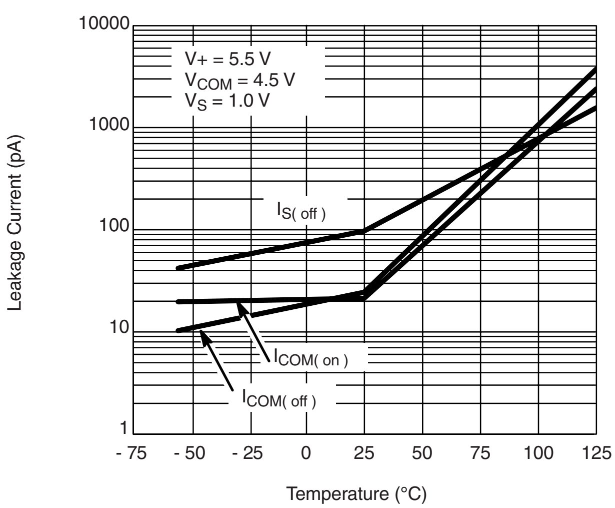
r_{ON} vs. Analog Voltage and Temperature



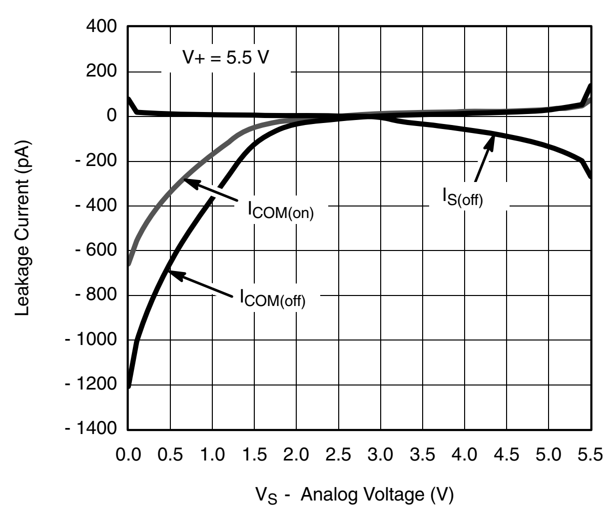
Supply Current vs. Temperature



Supply Current vs. Input Switching Frequency

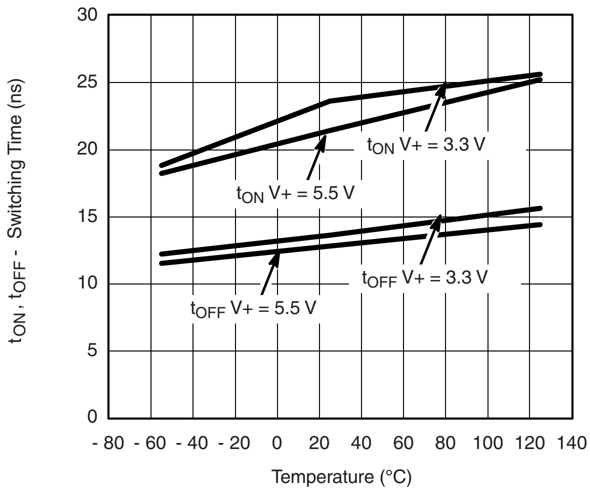


Leakage Current vs. Temperature

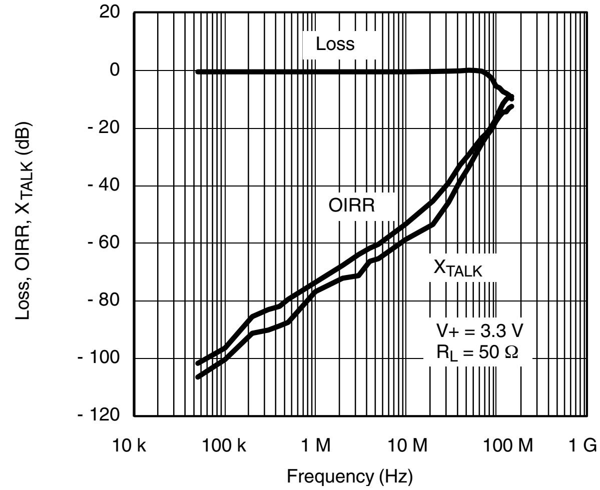


Leakage vs. Analog Voltage

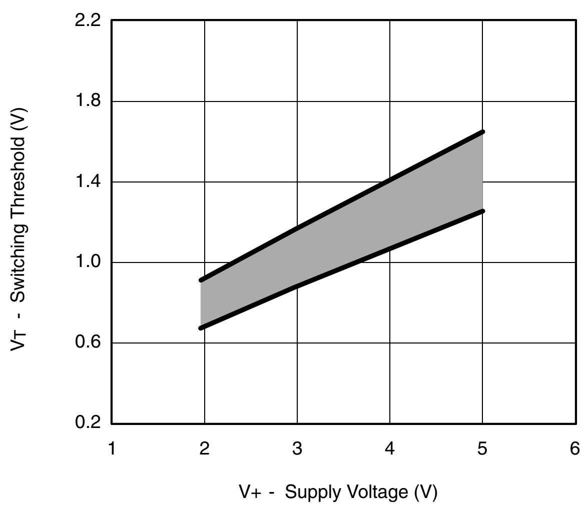
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



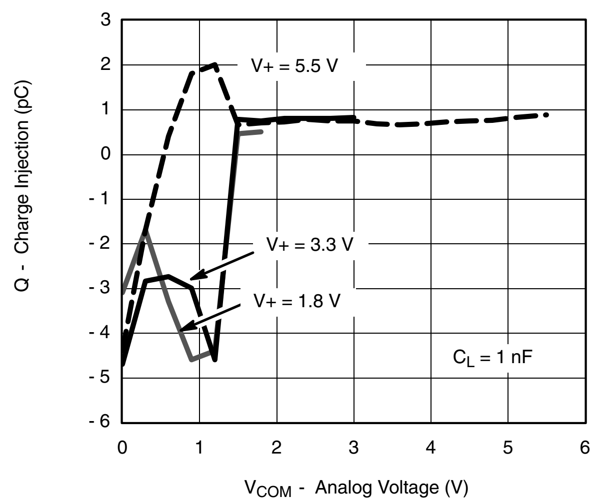
Switching Time vs. Temperature



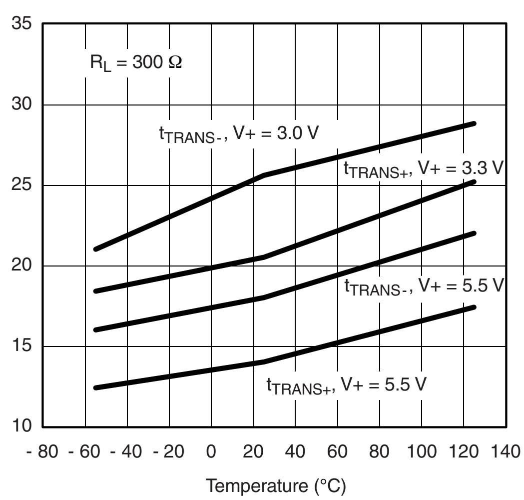
Insertion Loss, Off-Isolation Crosstalk vs. Frequency



Switching Threshold vs. Supply Voltage



Charge Injection vs. Analog Voltage



Transistion Time vs. Temperature

TEST CIRCUITS

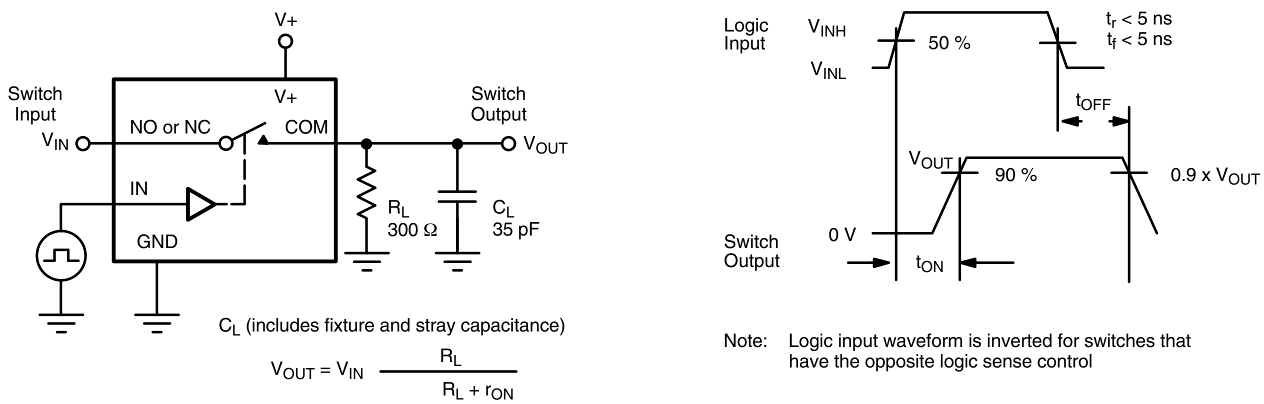


Figure 1. Switching Time

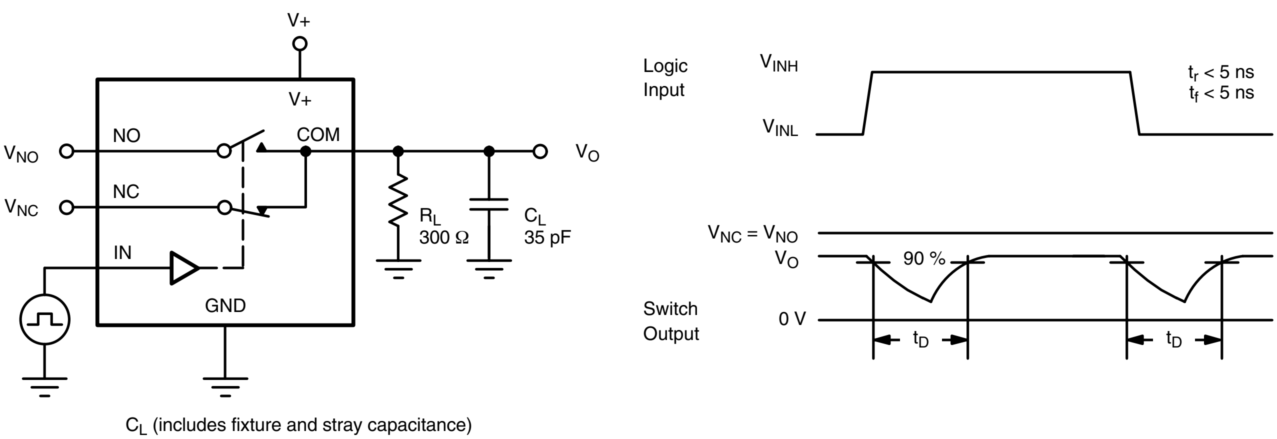


Figure 2. Break-Before-Make

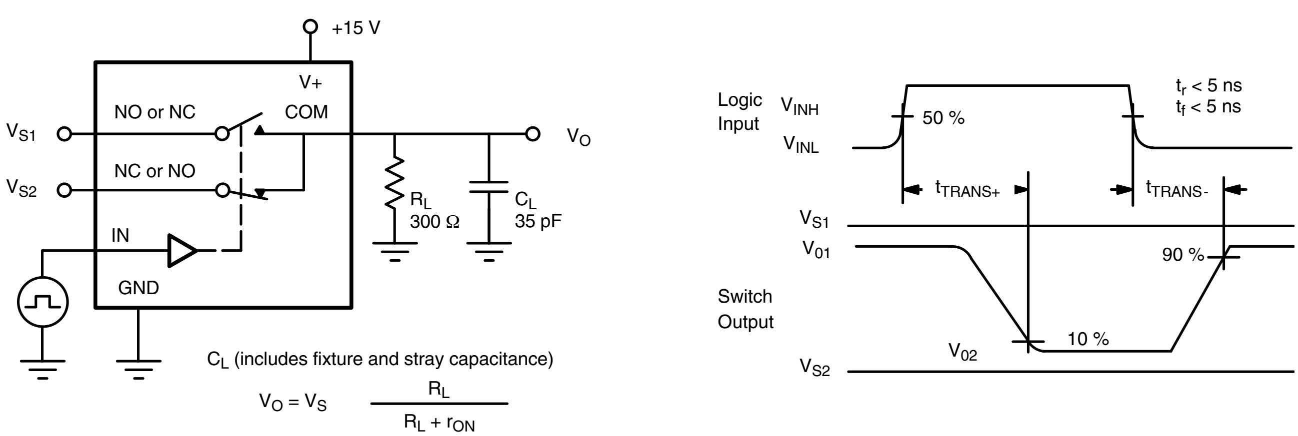


Figure 3. Transition Time

TEST CIRCUITS

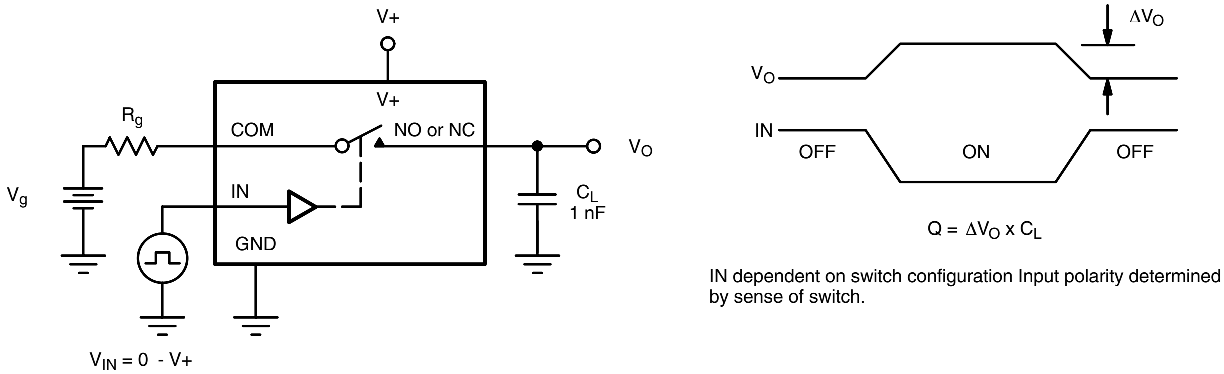


Figure 4. Charge Injection

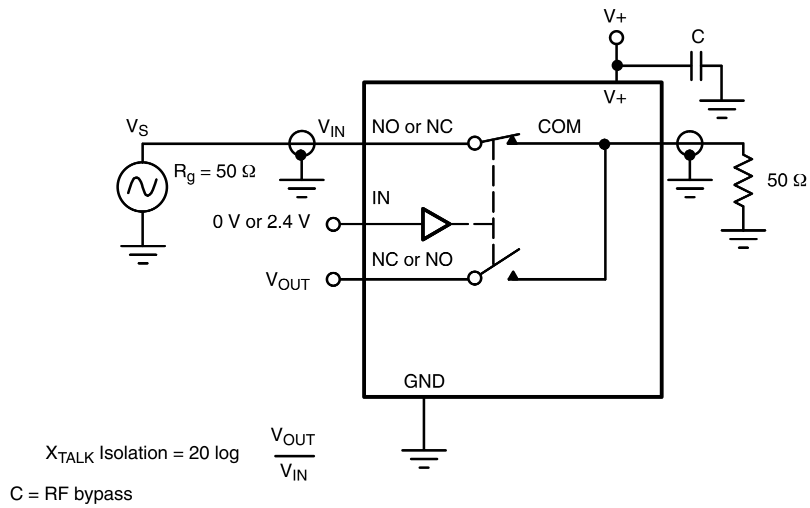


Figure 5. Crosstalk

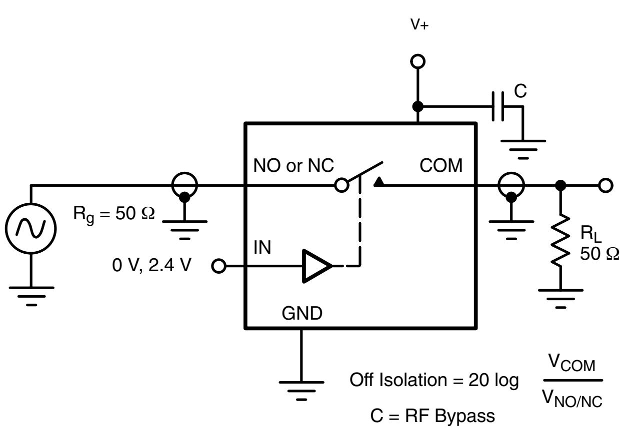


Figure 6. Off Isolation

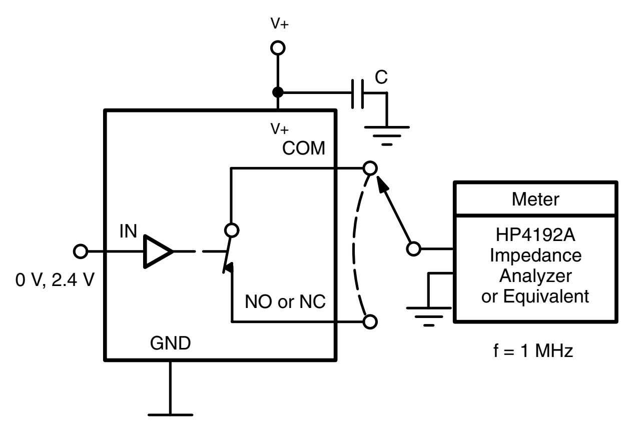


Figure 7. Source/Drain Capacitances

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