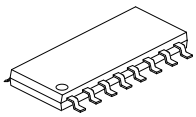
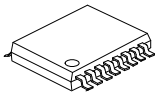
U74LV4052

CMOS IC

DUAL 4-CHANNEL ANALOG MULTIPLEXERS/DEMULTIPLEXERS



SOP-16



TSSOP-16

■ DESCRIPTION

These dual 4-channel CMOS analog multiplexers/demultiplexers are designed for 2-V to 5.5-V V_{CC} operation.

The **U74LV4052** handles both analog and digital signals. Each channel permits signals with amplitudes up to 5.5V (peak) to be transmitted in either direction.

Applications include signal gating, chopping, modulation or demodulation (modem), and signal multiplexing for analog-to-digital and digital-to-analog conversion systems.

■ FEATURES

* 2-V to 5.5-V V_{CC} Operation
* Fast Switching
* High On-Off Output-Voltage Ratio
* Low Crosstalk Between Switches
* Extremely Low Input Current

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LV4052L-S16-R	U74LV4052G-S16-R	SOP-16	Tape Reel
U74LV4052L-P16-R	U74LV4052G-P16-R	TSSOP-16	Tape Reel

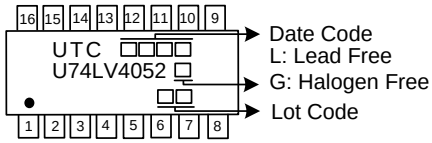
U74LVC157G-S16-R

(1)Packing Type — (1) R: Tape Reel

(2)Package Type — (2) S16: SOP-16, P16: TSSOP-16

(3)Green Package — (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



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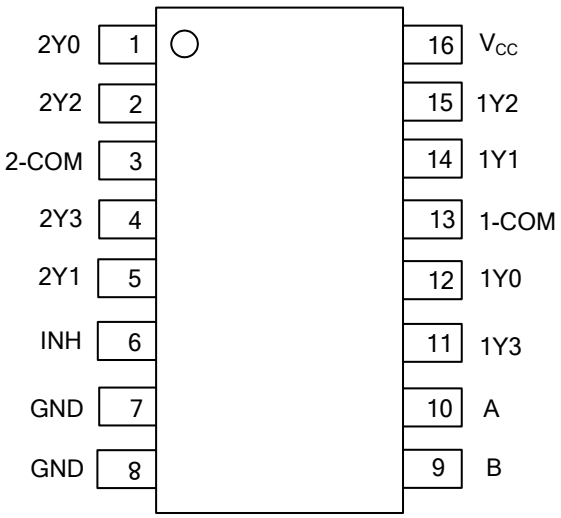
■ PIN CONFIGURATION

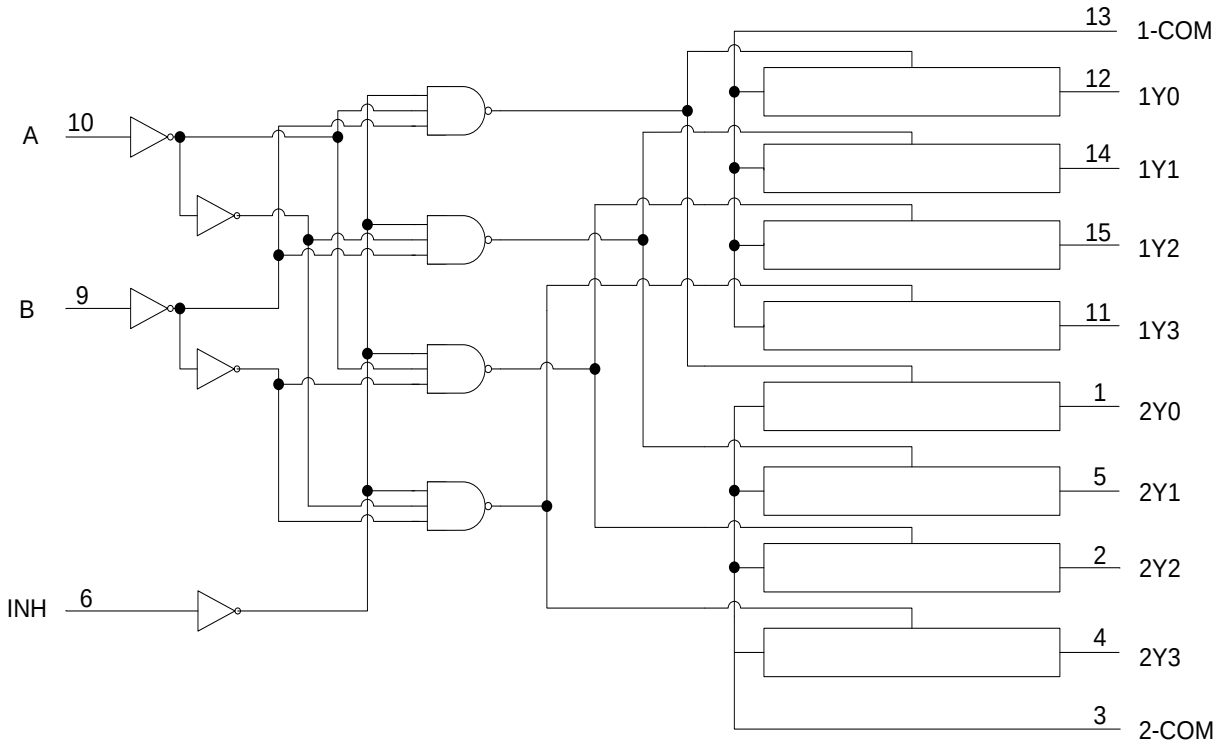


■ FUNCTION TABLE

INPUTS			ON Channel
INH	B	A	
L	L	L	1Y0, 2Y0
L	L	H	1Y1, 2Y1
L	H	L	1Y2, 2Y2
L	H	H	1Y3, 2Y3
H	X	X	None

Note: H: HIGH voltage level; L: LOW voltage level; X: Don't care

■ LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply voltage range	V_{CC}	-0.5 ~ +7.0	V
Input voltage range	V_{IN}	-0.5 ~ +7.0	V
Switch I/O voltage range	V_{IO}	-0.5~Vcc+0.5	V
Input clamp current	I_{IK}	-20	mA
I/O diode Current	I_{IOK}	-50	mA
Switch through current	I_T	±25	mA
Continuous current through V_{CC} or GND	I_{CC}	±50	mA
Storage temperature range	T_{STG}	-65 ~ +150	°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-16	θ_{JA}	73	°C/W
	TSSOP-16		108	°C/W

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}		2.0		5.5	V
Control Input Voltage	V_{IN}		0		5.5	V
Input/output Voltage	V_{IO}		0		V_{CC}	V
Input Transition Rise or Fall rate	$\Delta t/\Delta v$	V_{CC}=2.3V to 2.7V			200	ns/V
		V_{CC}=3V to 3.6V			100	
		V_{CC}=4.5V to 5.5V			20	
Operating free-air temperature	T_A		-40		+85	°C

Note: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

■ DC ELECTRICAL CHARACTERISTICS (T_A =25°C , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input voltage	High-level	V_{IH}	V_{CC}=2V		1.5			V
			V_{CC}=2.3 ~ 2.7V		V_{CC}×0.7			
			V_{CC}=3 ~ 3.6V		V_{CC}×0.7			
			V_{CC}=4.5 ~ 5.5V		V_{CC}×0.7			
	Low-level	V_{IL}	V_{CC}=2V				0.5	
			V_{CC}=2.3 ~ 2.7V				V_{CC}×0.3	
			V_{CC}=3 ~ 3.6V				V_{CC}×0.3	
			V_{CC}=4.5 ~ 5.5V				V_{CC}×0.3	
ON-state switch resistance		r_{ON}	V_{INH}=V_{IL}, V_I =V_{CC} or GND, I_T=2mA	V_{CC}=2.3V		43	180	Ω
				V_{CC}=3V		34	150	
				V_{CC}=4.5V		25	75	
Peak ON-state resistance		$r_{ON\ (p)}$	V_{INH}=V_{IL}, V_I =V_{CC} or GND I_T=2mA	V_{CC}=2.3V		133	500	Ω
				V_{CC}=3V		63	180	
				V_{CC}=4.5V		35	100	
Difference in on-state resistance between switches		△r_{ON}	V_{INH}=V_{IL}, V_I =V_{CC} or GND I_T=2mA	V_{CC}=2.3V		1.5	30	Ω
				V_{CC}=3V		1.1	20	
				V_{CC}=4.5V		0.7	15	
Off-state switch leakage current		$I_{S(off)}$	V_I=V_{CC} and V_O =GND, or V_I=GND and V_O =V_{CC}, V_{INH}=V_{IH}	V_{CC}=5.5V			±0.1	μA
On-state switch leakage current		$I_{S(on)}$	V_{INH}=V_{IL}, V_I =V_{CC} or GND	V_{CC}=5.5V			±0.1	μA
Supply Current		I_{CC}	V_I= V_{CC} or GND	V_{CC}=5.5V			20	μA
Control input current		I_I	V_{IN}= 5.5V or GND	V_{CC}=0 ~ 5.5V			±0.1	μA

■ AC ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Propagation delay time from COM or Y to Y or COM	t_{PLH}/t_{PHL}	C_L=15pF	V_{CC}=2.5±0.2		1.9	10	ns
			V_{CC}=3.3±0.3		1.2	6	
			V_{CC}=5±0.5		0.7	4	
		C_L=50pF	V_{CC}=2.5±0.2		3.8	12	ns
			V_{CC}=3.3±0.3		2.5	9	
			V_{CC}=5±0.5		1.5	6	
Enable delay time from INH to COM or Y	t_{PZH}/t_{PZL}	C_L=15pF	V_{CC}=2.5±0.2		8	18	ns
			V_{CC}=3.3±0.3		5.7	12	
			V_{CC}=5±0.5		4	8	
		C_L=50pF	V_{CC}=2.5±0.2		9.4	28	ns
			V_{CC}=3.3±0.3		6.7	20	
			V_{CC}=5±0.5		4.7	14	
Disable delay time from INH to COM or Y	t_{PHZ}/t_{PLZ}	C_L=15pF	V_{CC}=2.5±0.2		8.3	18	ns
			V_{CC}=3.3±0.3		6.6	12	
			V_{CC}=5±0.5		5	8	
		C_L=50pF	V_{CC}=2.5±0.2		12.4	28	ns
			V_{CC}=3.3±0.3		9.5	20	
			V_{CC}=5±0.5		6.9	14	

■ CAPACITANCE CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Control input capacitance	C_{IC}	f=10MHz, V_{CC}=3.3V		2.1		pF
COMMON terminal capacitance	C_{IS}	V_{CC}=3.3V		13.1		pF
SWITCH terminal capacitance	C_{OS}	V_{CC}=3.3V		5.6		pF
Feedthrough capacitance	C_F	V_{CC}=3.3V		0.5		pF

■ ANALOG SWITCH CHARACTERISTICS (GND=0V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Sine-Wave Distortion from COM or Y to Y or COM	THD	R_L=10k, C_L=50p, f_{IN}=1kHz (sine wave)	V_{IN}=2Vp-p V_{CC}=2.3V		0.1		%
			V_{IN}=2.5Vp-p V_{CC}=3V		0.1		%
			V_{IN}=4Vp-p V_{CC}=4.5V		0.1		%
Frequency response(switch on) from COM or Y to Y or COM	f_{MAX}	R_L=600Ω,C_L=50pF , f_{IN}=1MHz (sine wave)	V_{CC}=2.3V		30		MHz
			V_{CC}=3V		35		MHz
			V_{CC}=4.5V		50		MHz
Feedthrough attenuation from COM or Y to Y or COM (switch off)		R_L=600Ω,C_L=50pF ,f_{IN}=1MHz (sine wave)	V_{CC}=2.3V		-45		dB
			V_{CC}=3V		-45		dB
			V_{CC}=4.5V		-45		dB
Crosstalk from COM or Y to Y or COM (between any switches)		R_L=600Ω,C_L=50pF ,f_{IN}=1MHz (sine wave)	V_{CC}=2.3V		-45		dB
			V_{CC}=3V		-45		dB
			V_{CC}=4.5V		-45		dB
Crosstalk from INH to COM or Y (control input to signal output)		R_L=600Ω,C_L=50pF ,f_{IN}=1MHz (sine wave)	V_{CC}=2.3V		20		mV
			V_{CC}=3V		35		mV
			V_{CC}=4.5V		65		mV

■ OPERATING CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C_{PD}	C_L=50pF, f=10MHz		11.8		pF

Notes: 1. Adjust f_{IN} voltage to obtain 0 dBm at output. Increase fin frequency until dB meter reads -3 dB.
2. Adjust f_{IN} voltage to obtain 0 dBm at input.

■ TEST CIRCUIT AND WAVEFORMS

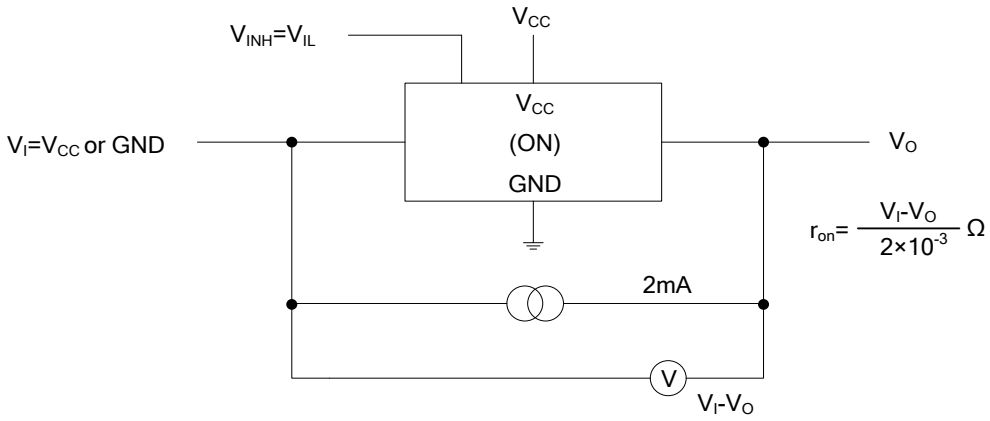
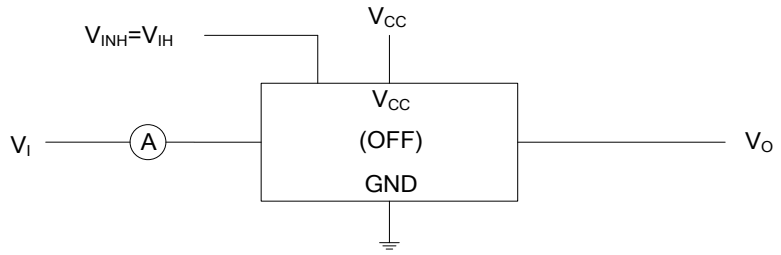


Fig. 1 On-State Resistance Test Circuit



Condition 1: V_I=0, V_O=V_{CC}
Condition 2: V_I=V_{CC}, V_O=0

Fig. 2 Off-State Switch Leakage-Current Test Circuit

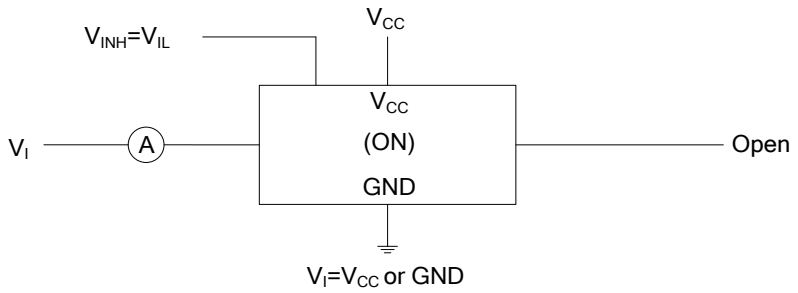


Fig. 3 On-State Switch Leakage-Current Test Circuit

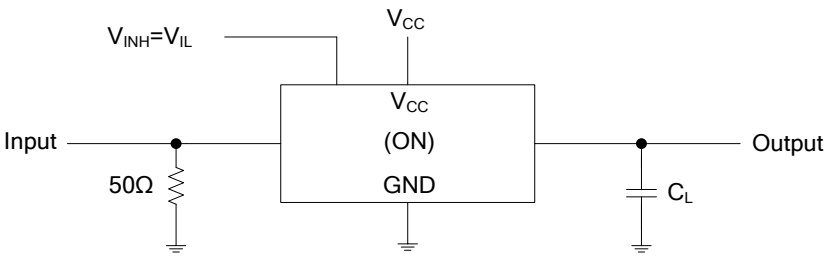
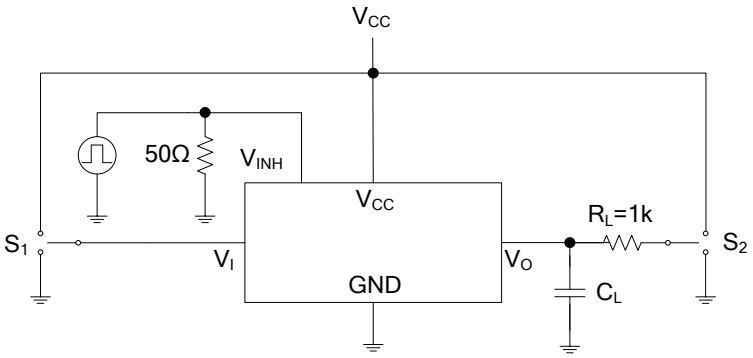


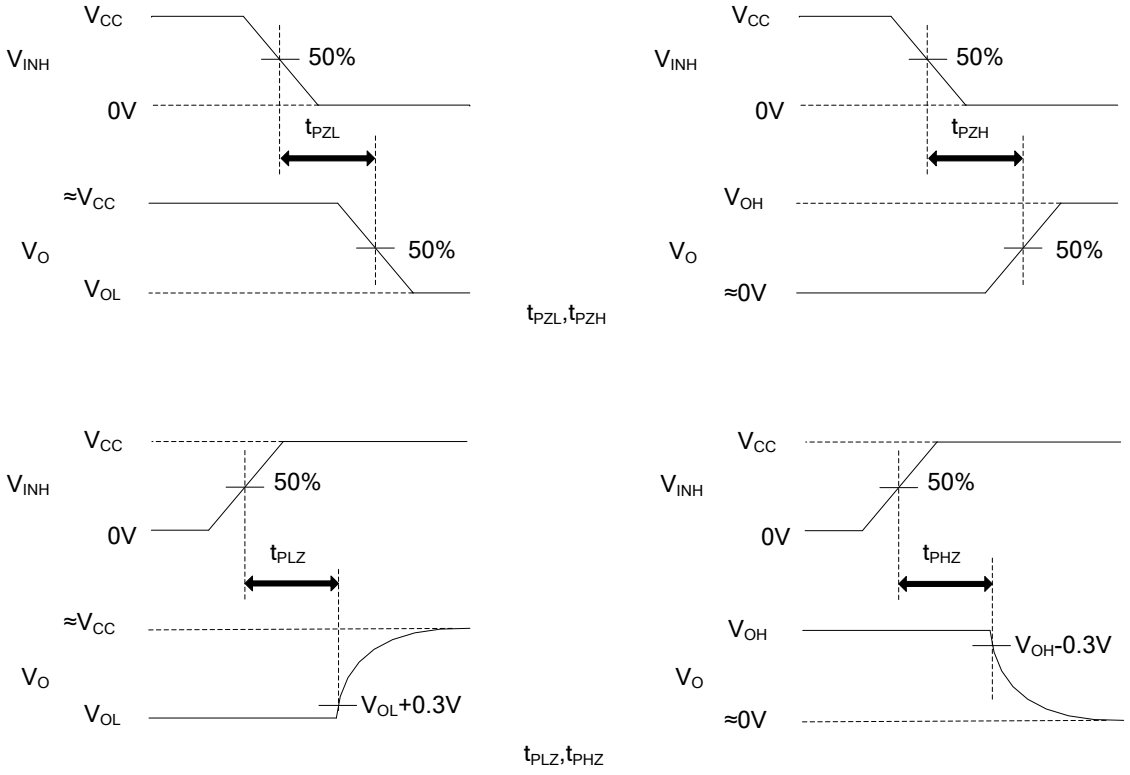
Fig. 4 Propagation Delay Time, Signal Input to Signal Output

■ TEST CIRCUIT AND WAVEFORMS (Cont.)



TEST	S1	S2
t_{PLZ}/t_{PZL}	GND	V_{CC}
t_{PHZ}/t_{PZH}	Vcc	GND

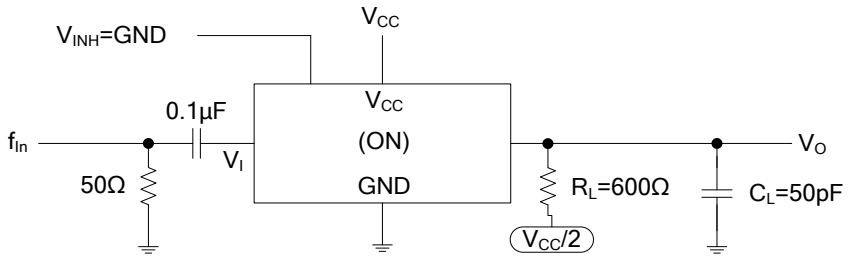
TEST CIRCUIT



VOLTAGE WAVEFORMS

Fig. 5 Switching Time (t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}), Control to Signal Output

■ TEST CIRCUIT AND WAVEFORMS (Cont.)



Nont: f_{In} is a sine wave.

Fig. 6 Frequency Response (Switch On)

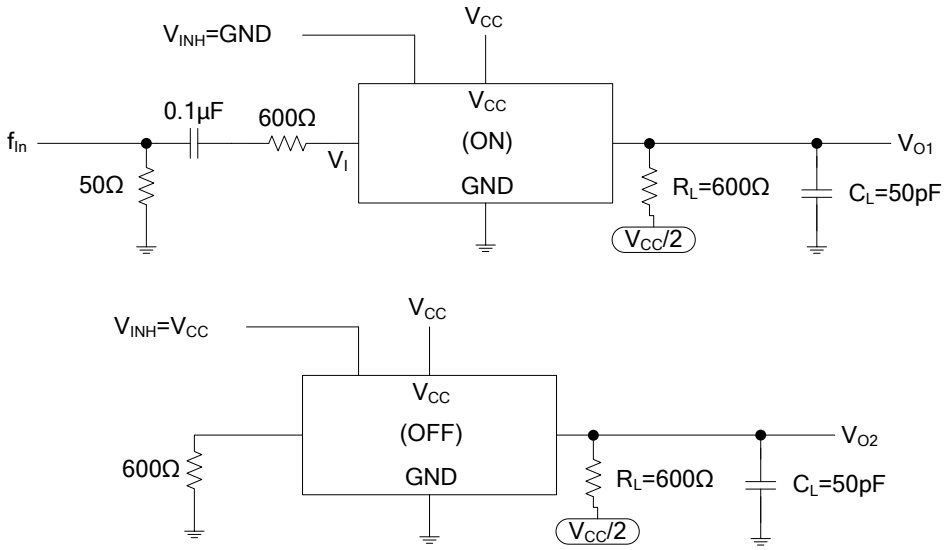


Fig. 7 Crosstalk Between Any Two Switches

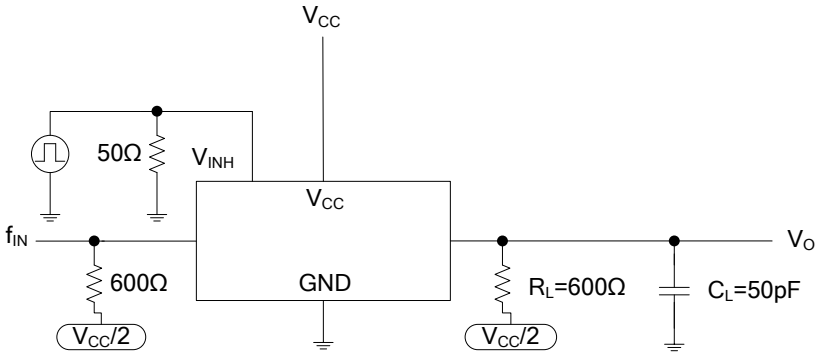


Fig. 8 Crosstalk Between Control Input and Switch Output

■ TEST CIRCUIT AND WAVEFORMS (Cont.)

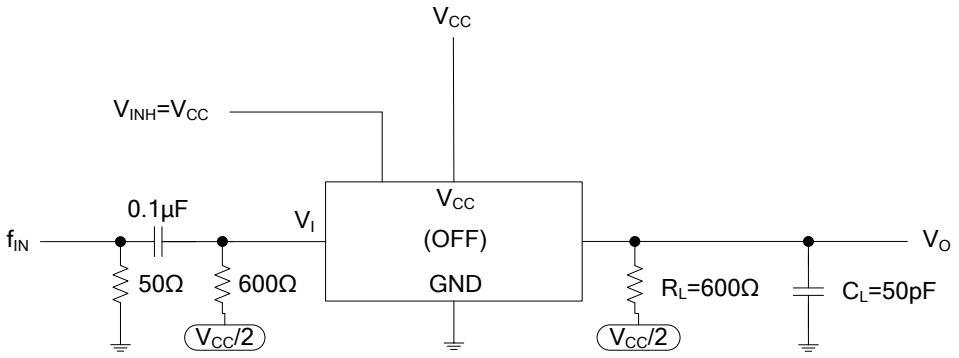


Fig. 9 Feedthrough Attenuation (Switch Off)

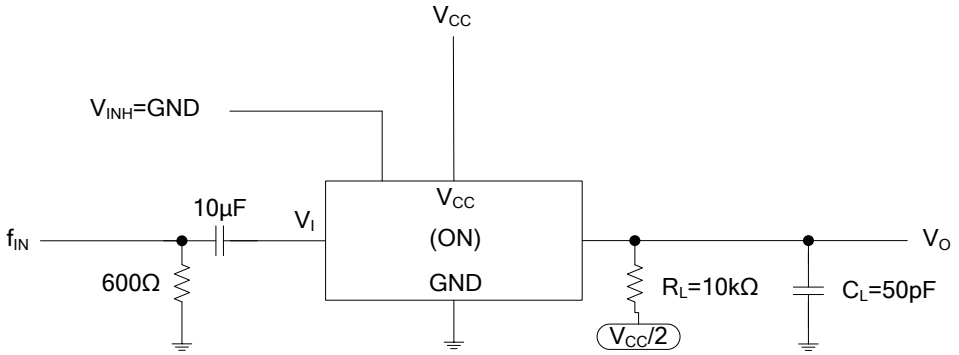


Fig. 10 Sine-Wave Distortion

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