

February 1998 - Revised October 2003

High-Speed CMOS Logic Quad Analog Switch with Level Translation

Features

- **Wide Analog-Input-Voltage Range**
 $V_{CC} - V_{EE}$ 0V to 10V
- **Low "ON" Resistance**
 - 45Ω (Typ) $V_{CC} = 4.5V$
 - 35Ω (Typ) $V_{CC} = 6V$
 - 30Ω (Typ) $V_{CC} - V_{EE} = 9V$
- **Fast Switching and Propagation Delay Times**
- **Low "OFF" Leakage Current**
- **Built-In "Break-Before-Make" Switching**
- **Logic-Level Translation to Enable 5V Logic to Accommodate ±5V Analog Signals**
- **Wide Operating Temperature Range . . . -55°C to 125°C**
- **HC Types**
 - 2V to 10V Operation
 - **High Noise Immunity: $N_{IL} = 30\%$, $N_{IH} = 30\%$ of V_{CC} at $V_{CC} = 5V$**
- **HCT Types**
 - **Direct LSTTL Input Logic Compatibility, $V_{IL} = 0.8V$ (Max), $V_{IH} = 2V$ (Min)**
 - **CMOS Input Compatibility, $I_I \leq 1\mu A$ at V_{OL} , V_{OH}**

Description

The 'HC4316 and CD74HCT4316 contain four independent digitally controlled analog switches that use silicon-gate CMOS technology to achieve operating speeds similar to LSTTL with the low power consumption of standard CMOS integrated circuits.

In addition these devices contain logic-level translation circuits that provide for analog signal switching of voltages between $\pm 5V$ via 5V logic. Each switch is turned on by a high-level voltage on its select input (S) when the common Enable (E) is Low. A High E disables all switches. The digital inputs can swing between V_{CC} and GND; the analog inputs/outputs can swing between V_{CC} as a positive limit and V_{EE} as a negative limit. Voltage ranges are shown in Figures 2 and 3.

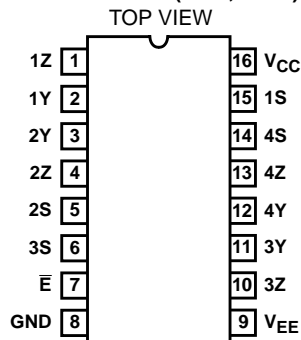
Ordering Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE
CD54HC4316F3A	-55 to 125	16 Ld CERDIP
CD74HC4316E	-55 to 125	16 Ld PDIP
CD74HC4316M	-55 to 125	16 Ld SOIC
CD74HC4316MT	-55 to 125	16 Ld SOIC
CD74HC4316M96	-55 to 125	16 Ld SOIC
CD74HC4316NSR	-55 to 125	16 Ld SOP
CD74HC4316PW	-55 to 125	16 Ld TSSOP
CD74HC4316PWR	-55 to 125	16 Ld TSSOP
CD74HC4316PWT	-55 to 125	16 Ld TSSOP
CD74HCT4316E	-55 to 125	16 Ld PDIP
CD74HCT4316M	-55 to 125	16 Ld SOIC
CD74HCT4316MT	-55 to 125	16 Ld SOIC
CD74HCT4316M96	-55 to 125	16 Ld SOIC

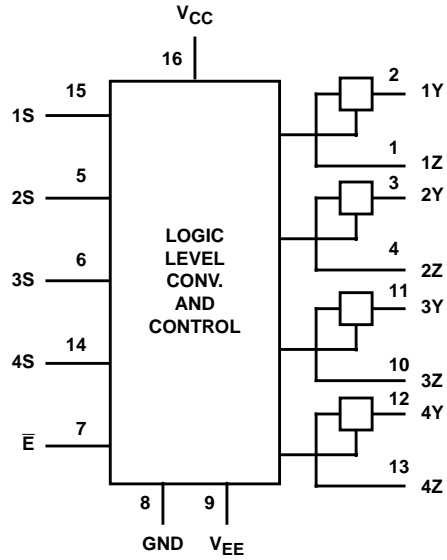
NOTE: When ordering, use the entire part number. The suffixes 96 and R denote tape and reel. The suffix T denotes a small-quantity reel of 250.

Pinout

CD54HC4316 (CERDIP)
 CD74HC4316 (PDIP, SOIC, SOP, TSSOP)
 CD74HCT4316 (PDIP, SOIC)



Functional Diagram



TRUTH TABLE

INPUTS		SWITCH
\bar{E}	S	
L	L	OFF
L	H	ON
H	X	OFF

H= High Level Voltage
 L= Low Level Voltage
 X= Don't Care

Logic Diagram

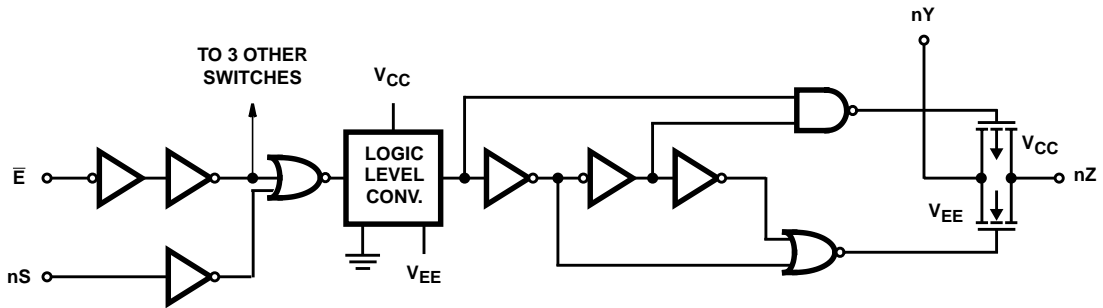


FIGURE 1. ONE SWITCH

CD54HC4316, CD74HC4316, CD74HCT4316

Absolute Maximum Ratings

DC Supply Voltage, V_{CC}	-0.5V to 7V
DC Supply Voltage, $V_{CC} - V_{EE}$	-0.5V to 10.5V
DC Supply Voltage, V_{EE}	0.5V to -7V
DC Input Diode Current, I_{IK}	
For $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$	$\pm 20mA$
DC Switch Diode Current, I_{OK}	
For $V_I < V_{EE} - 0.5V$ or $V_I < V_{CC} + 0.5V$	$\pm 25mA$
DC Switch Diode Current	
For $V_I > V_{EE} - 0.5V$ or $V_I < V_{CC} + 0.5V$	$\pm 25mA$
DC Output Diode Current, I_{OK}	
For $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$	$\pm 20mA$
DC Output Source or Sink Current per Output Pin, I_O	
For $V_O > -0.5V$ or $V_O < V_{CC} + 0.5V$	$\pm 25mA$
DC V_{CC} or Ground Current, I_{CC}	$\pm 50mA$

Operating Conditions

Temperature Range, T_A	-55°C to 125°C
Supply Voltage Range, V_{CC}	
HC Types2V to 6V
HCT Types	4.5V to 5.5V
Supply Voltage Range, $V_{CC} - V_{EE}$	
HC, HCT Types (Figure 2)2V to 10V
Supply Voltage Range, V_{EE}	
HC, HCT Types (Figure 3)	0V to -6V
DC Input or Output Voltage, V_I	GND to V_{CC}
Analog Switch I/O Voltage, V_{IS}	V_{EE} (Min)
.....	V_{CC} (Max)
Input Rise and Fall Time, t_r, t_f	
2V	1000ns (Max)
4.5V	500ns (Max)
6V	400ns (Max)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. The package thermal impedance is calculated in accordance with JESD 51-7.

Thermal Information

Package Thermal Impedance, θ_{JA} (see Note 1):	
E (PDIP) Package	67°C/W
M (SOIC) Package	73°C/W
NS (SOP) Package	64°C/W
PW (TSSOP) Package	108°C/W
Maximum Junction Temperature (Plastic Package)	150°
Maximum Storage Temperature Range	-65°C to 150°
Maximum Lead Temperature (Soldering 10s)	300°
SOIC - Lead Tips Only	

Recommended Operating Area as a Function of Supply Voltage

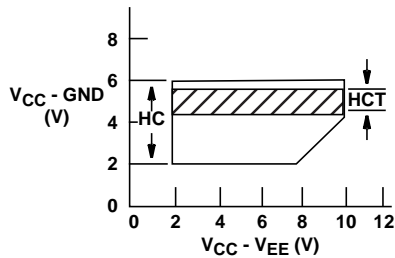


FIGURE 2.

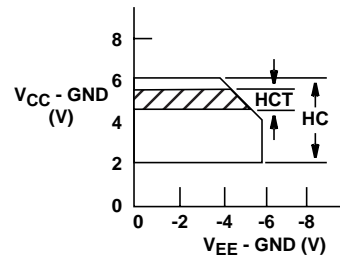


FIGURE 3.

CD54HC4316, CD74HC4316, CD74HCT4316

DC Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS				25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		V _I (V)	V _{IS} (V)	V _{EE} (V)	V _{CC} (V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES													
High Level Input Voltage	V _{IH}	-	-	-	2	1.5	-	-	1.5	-	1.5	-	V
					4.5	3.15	-	-	3.15	-	3.15	-	V
					6	4.2	-	-	4.2	-	4.2	-	V
Low Level Input Voltage	V _{IL}	-	-	-	2	-	-	0.5	-	0.5	-	0.5	V
					4.5	-	-	1.35	-	1.35	-	1.35	V
					6	-	-	1.8	-	1.8	-	1.8	V
“ON” Resistance I _O = 1mA (Figures 4, 5)	R _{ON}	V _{IH} or V _{IL}	V _{CC} or V _{EE}	0	4.5	-	45	180	-	225	-	270	Ω
				0	6	-	35	160	-	200	-	240	Ω
				-4.5	4.5	-	30	135	-	170	-	205	Ω
			V _{CC} to V _{EE}	0	4.5	-	85	320	-	400	-	480	Ω
				0	6	-	55	240	-	300	-	360	Ω
				-4.5	4.5	-	35	170	-	215	-	255	Ω
Maximum “ON” Resistance Between Any Two Channels	ΔR _{ON}	-	-	0	4.5	-	10	-	-	-	-	-	Ω
				0	6	-	8.5	-	-	-	-	-	Ω
				-4.5	4.5	-	5	-	-	-	-	-	Ω
Switch Off Leakage Current	I _{IZ}	V _{IH} or V _{IL}	V _{CC} - V _{EE}	0	6	-	-	±0.1	-	±1	-	±1	μA
				-5	5	-	-	±0.1	-	±1	-	±1	μA
Control Input Leakage Current	I _{IL}	V _{CC} or GND	-	0	6	-	-	±0.1	-	±1	-	±1	μA
Quiescent Device Current I _O = 0	I _{CC}	V _{CC} or GND	When V _{IS} = V _{EE} , V _{OS} = V _{CC}	0	6	-	-	8	-	80	-	160	μA
				-5	5	-	-	16	-	160	-	320	μA
When V _{IS} = V _{CC} , V _{OS} = V _{EE}				0	6	-	-	8	-	80	-	160	μA
				-5	5	-	-	16	-	160	-	320	μA
HCT TYPES													
High Level Input Voltage	V _{IH}	-	-	-	4.5 to 5.5	2	-	-	2	-	2	-	V
Low Level Input Voltage	V _{IL}	-	-	-	4.5 to 5.5	-	-	0.8	-	0.8	-	0.8	V
“ON” Resistance I _O = 1mA (Figures 4, 5)	R _{ON}	V _{IH} or V _{IL}	V _{CC} or V _{EE}	0	4.5	-	45	180	-	225	-	270	Ω
				-4.5	4.5	-	30	135	-	170	-	205	Ω
			V _{CC} to V _{EE}	0	4.5	-	85	320	-	400	-	480	Ω
				-4.5	4.5	-	35	170	-	215	-	255	Ω
Maximum “ON” Resistance Between Any Two Channels	ΔR _{ON}	-	-	0	4.5	-	10	-	-	-	-	-	Ω
				-4.5	4.5	-	5	-	-	-	-	-	Ω
Switch Off Leakage Current	I _{IZ}	V _{IH} or V _{IL}	V _{CC} - V _{EE}	0	6	-	-	±0.1	-	±1	-	±1	μA
				-5	5	-	-	±0.1	-	±1	-	±1	μA

CD54HC4316, CD74HC4316, CD74HCT4316

DC Electrical Specifications (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS				25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		V _I (V)	V _{IS} (V)	V _{EE} (V)	V _{CC} (V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	
Control Input Leakage Current	I _I	V _{CC} or GND	-	0	5.5	-	-	±0.1	-	±1	-	±1	μA
Quiescent Device Current I _O = 0	I _{CC}	Any Voltage Between V _{CC} and GND	When V _{IS} = V _{EE} , V _{OS} = V _{CC}	0	5.5	-	-	8	-	80	-	160	μA
			When V _{IS} = V _{CC} , V _{OS} = V _{EE}	-4.5	5.5	-	-	16	-	160	-	320	μA
Additional Quiescent Device Current Per Input Pin: 1 Unit Load	ΔI _{CC} (Note 2)	V _{CC} -2.1	-	-	4.5 to 5.5	-	100	360	-	450	-	490	μA

NOTE:

- For dual-supply systems theoretical worst case (V_I = 2.4V, V_{CC} = 5.5V) specification is 1.8mA.

HCT Input Loading Table

INPUT	UNIT LOADS
All	0.5

NOTE: Unit Load is ΔI_{CC} limit specified in DC Electrical Table, e.g., 360μA max at 25°C.

Switching Specifications Input t_r, t_f = 6ns

PARAMETER	SYMBOL	TEST CONDITIONS	V _{EE} (V)	V _{CC} (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
HC TYPES												
Propagation Delay, Switch In to Out	t _{PLH} , t _{PHL}	C _L = 50pF	0	2	-	-	60	-	75	-	90	ns
			0	4.5	-	-	12	-	15	-	18	ns
			0	6	-	-	10	-	13	-	15	ns
			-4.5	4.5	-	-	8	-	10	-	12	ns
Turn "ON" Time \bar{E} to Out	t _{PZH} , t _{PZL}	C _L = 50pF	0	2	-	-	205	-	255	-	310	ns
			0	4.5	-	-	41	-	51	-	62	ns
			0	6	-	-	35	-	43	-	53	ns
			-4.5	4.5	-	-	37	-	47	-	56	ns
		C _L = 15pF	-	5	-	17	-	-	-	-	-	ns
Turn "ON" Time nS to Out	t _{PZH} , t _{PZL}	C _L = 50pF	0	2	-	-	175	-	220	-	265	ns
			0	4.5	-	-	35	-	44	-	53	ns
			0	6	-	-	30	-	37	-	45	ns
			-4.5	4.5	-	-	34	-	43	-	51	ns
		C _L = 15pF	-	5	-	14	-	-	-	-	-	ns
Turn "OFF" Time \bar{E} to Out	t _{PLZ} , t _{PHZ}	C _L = 50pF	0	2	-	-	205	-	255	-	310	ns
			0	4.5	-	-	41	-	51	-	62	ns
			0	6	-	-	35	-	43	-	53	ns
			-4.5	4.5	-	-	37	-	47	-	56	ns
		C _L = 15pF	-	5	-	17	-	-	-	-	-	ns

CD54HC4316, CD74HC4316, CD74HCT4316

Switching Specifications Input $t_r, t_f = 6\text{ns}$ (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS	V _{EE} (V)	V _{CC} (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
Turn "OFF" Time nS to Out	t _{PLZ} , t _{PHZ}	C _L = 50pF	0	2	-	-	175	-	220	-	265	ns
			0	4.5	-	-	35	-	44	-	53	ns
			0	6	-	-	30	-	37	-	45	ns
			-4.5	4.5	-	-	34	-	43	-	51	ns
		C _L = 15pF	-	5	-	14	-	-	-	-	-	ns
Input (Control) Capacitance	C _I	-	-	-	-	10	-	10	-	10	pF	
Power Dissipation Capacitance (Notes 3, 4)	C _{PD}	-	-	5	-	42	-	-	-	-	pF	
HCT TYPES												
Propagation Delay, Switch In to Switch Out	t _{PLH} , t _{PHL}	C _L = 50pF	0	4.5	-	-	12	-	15	-	18	ns
			-4.5	4.5	-	-	8	-	10	-	12	ns
Turn "ON" Time \bar{E} to Out	t _{PZH}	C _L = 50pF	0	4.5	-	-	44	-	55	-	66	ns
			-4.5	4.5	-	-	42	-	53	-	63	ns
		C _L = 15pF	-	5	-	18	-	-	-	-	-	ns
	t _{PZL}	C _L = 50pF	0	4.5	-	-	56	-	70	-	85	ns
			-4.5	4.5	-	-	42	-	53	-	63	ns
		C _L = 15pF	-	5	-	24	-	-	-	-	-	ns
Turn "ON" Time nS to Out	t _{PZH}	C _L = 50pF	0	4.5	-	-	40	-	53	-	60	ns
			-4.5	4.5	-	-	34	-	43	-	51	ns
		C _L = 15pF	-	5	-	17	-	-	-	-	-	ns
	t _{PZL}	C _L = 50pF	0	4.5	-	-	50	-	63	-	75	ns
			-4.5	4.5	-	-	34	-	43	-	51	ns
		C _L = 15pF	-	5	-	18	-	-	-	-	-	ns
Turn "OFF" Time \bar{E} to Out	t _{PLZ}	C _L = 50pF	0	4.5	-	-	50	-	63	-	75	ns
			-4.5	4.5	-	-	46	-	58	-	69	ns
	t _{PLZ} , t _{PHZ}	C _L = 15pF	-	5	-	21	-	-	-	-	-	ns
			-	5	-	21	-	-	-	-	-	ns
Turn "OFF" Time nS to Out	t _{PHZ}	C _L = 50pF	0	4.5	-	-	44	-	55	-	66	ns
			-4.5	4.5	-	-	40	-	50	-	60	ns
	t _{PLZ} , t _{PHZ}	C _L = 15pF	-	5	-	18	-	-	-	-	-	ns
			-	5	-	18	-	-	-	-	-	ns
Input (Control) Capacitance	C _I	-	-	-	-	10	-	10	-	10	pF	
Power Dissipation Capacitance (Notes 3, 4)	C _{PD}	-	-	5	-	47	-	-	-	-	pF	

NOTES:

- C_{PD} is used to determine the dynamic power consumption, per package.
- $P_D = C_{PD} V_{CC}^2 f_i + \sum (C_L + C_S) V_{CC}^2 f_o$ where f_i = input frequency, f_o = output frequency, C_L = output load capacitance, C_S = switch capacitance, V_{CC} = supply voltage.

Analog Channel Specifications T_A = 25°C

PARAMETER	TEST CONDITIONS	V _{CC} (V)	HC4316	CD74HCT4316	UNITS
Switch Frequency Response Bandwidth at -3dB (Figure 6)	Figure 9 (Notes 5, 6)	4.5	>200	>200	MHz
Crosstalk Between Any Two Switches (Figure 7)	Figure 8 (Notes 6, 7)	4.5	TBE	TBE	dB

CD54HC4316, CD74HC4316, CD74HCT4316

Analog Channel Specifications $T_A = 25^\circ\text{C}$ (Continued)

PARAMETER	TEST CONDITIONS	V_{CC} (V)	HC4316	CD74HCT4316	UNITS
Total Harmonic Distortion	1kHz, $V_{IS} = 4V_{P-P}$ (Figure 10)	4.5	0.078	0.078	%
	1kHz, $V_{IS} = 8V_{P-P}$ (Figure 10)	9	0.018	0.018	%
Control to Switch Feedthrough Noise	Figure 11	4.5	TBE	TBE	mV
		9	TBE	TBE	mV
Switch "OFF" Signal Feedthrough (Figure 7)	Figure 12 (Notes 6, 7)	4.5	-62	-62	dB
Switch Input Capacitance, C_S	-	-	5	5	pF

NOTES:

5. Adjust input level for 0dBm at output, $f = 1\text{MHz}$.
6. V_{IS} is centered at $V_{CC}/2$.
7. Adjust input for 0dBm at V_{IS} .

Typical Performance Curves

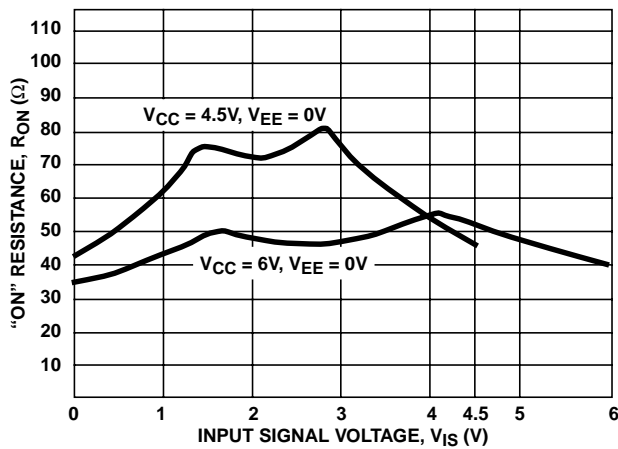


FIGURE 4. TYPICAL "ON" RESISTANCE vs INPUT SIGNAL VOLTAGE

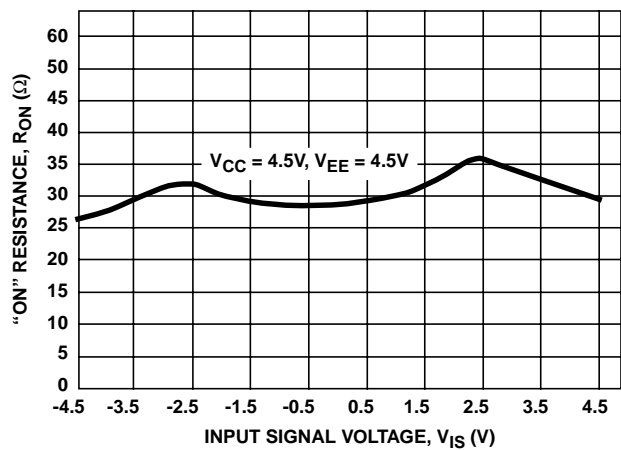


FIGURE 5. TYPICAL "ON" RESISTANCE vs INPUT SIGNAL VOLTAGE

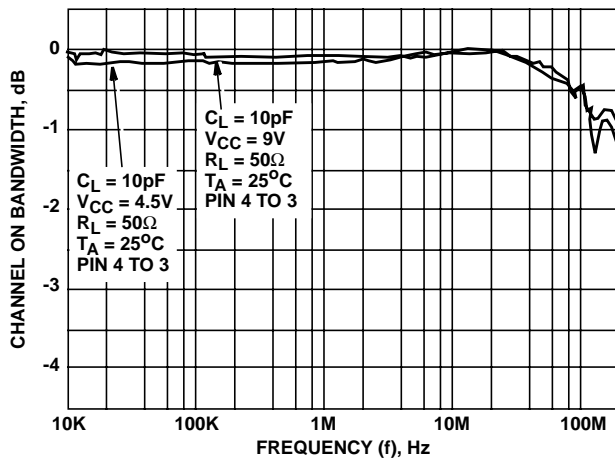


FIGURE 6. SWITCH FREQUENCY RESPONSE

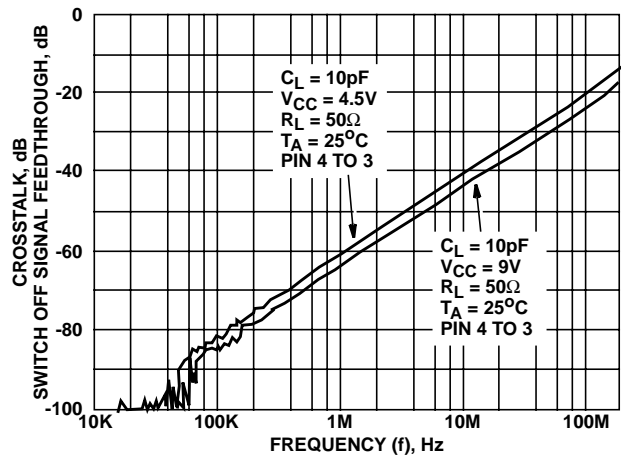


FIGURE 7. SWITCH-OFF SIGNAL FEEDTHROUGH AND CROSSTALK vs FREQUENCY

Analog Test Circuits

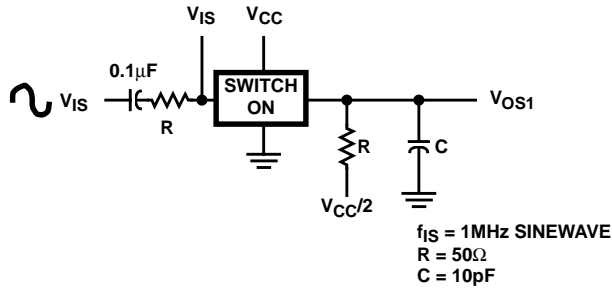


FIGURE 8. CROSTALK BETWEEN TWO SWITCHES TEST CIRCUIT

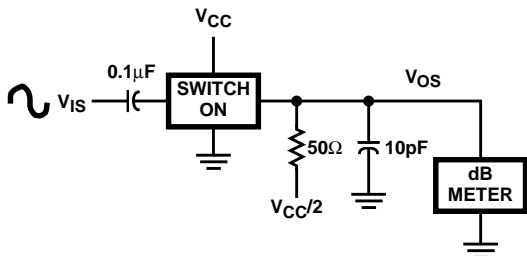
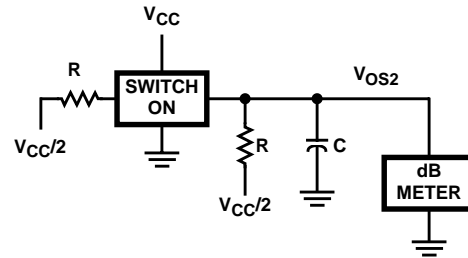


FIGURE 9. FREQUENCY RESPONSE TEST CIRCUIT

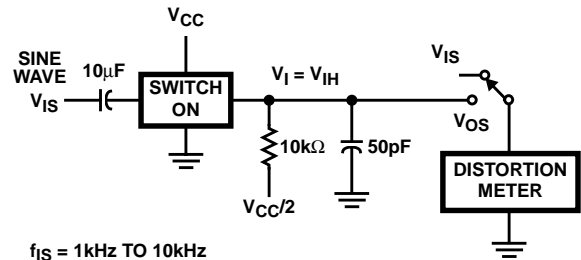


FIGURE 10. TOTAL HARMONIC DISTORTION TEST CIRCUIT

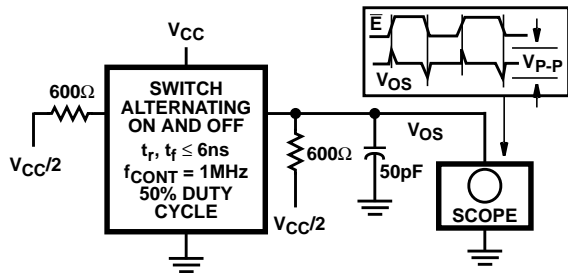


FIGURE 11. CONTROL-TO-SWITCH FEEDTHROUGH NOISE TEST CIRCUIT

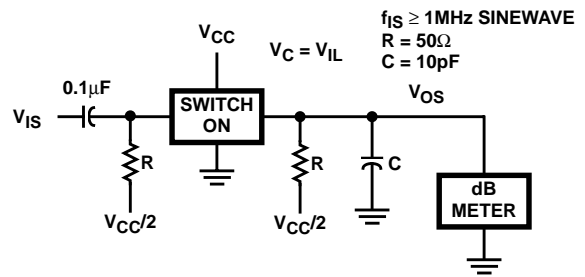


FIGURE 12. SWITCH OFF SIGNAL FEEDTHROUGH

Test Circuits and Waveforms

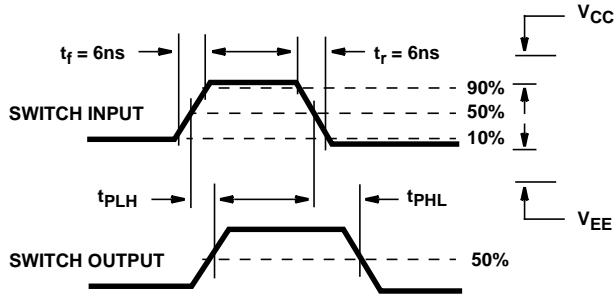


FIGURE 13. SWITCH PROPAGATION DELAY TIMES

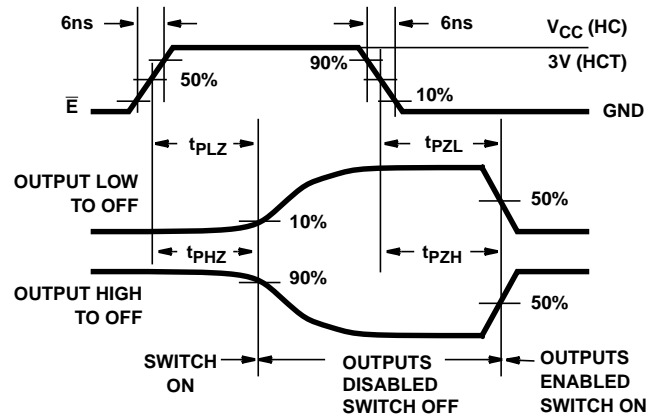
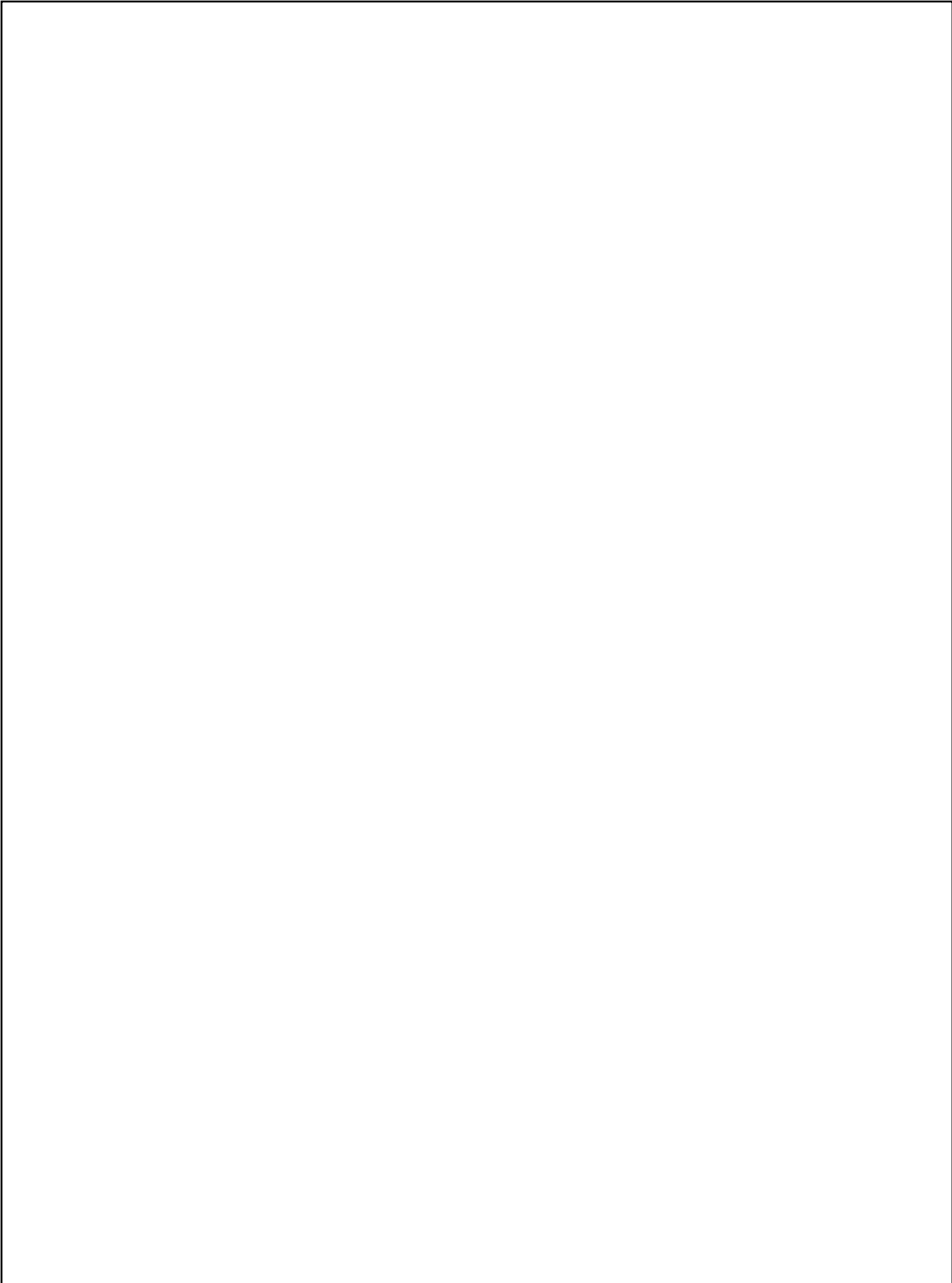


FIGURE 14. SWITCH TURN-ON AND TURN-OFF PROPAGATION DELAY TIMES WAVEFORMS



J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-012 variation AC.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265