

ADG428/ADG429—SPECIFICATIONS

DUAL SUPPLY¹ ($V_{DD} = +15\text{ V}$, $V_{SS} = -15\text{ V}$, $GND = 0\text{ V}$, $\overline{WR} = 0\text{ V}$, $\overline{RS} = 2.4\text{ V}$ unless otherwise noted)

Parameter	B Version −40°C to +25°C +85°C		T Version −55°C to +25°C +125°C		Units	Test Conditions/Comments	
ANALOG SWITCH							
Analog Signal Range	V _{SS} to V _{DD}		V _{SS} to V _{DD}		V	V _D = ±10 V, I _S = −1 mA	
R _{ON}	60		60		Ω typ		
	100	125	100	125	Ω max		
ΔR _{ON}	10		10		% max	−10 V < V _S < 10 V, I _S = −1 mA	
LEAKAGE CURRENTS							
Source OFF Leakage I _S (OFF)	±0.03	±0.3	±0.03	±0.3	nA typ	V _D = ±10 V, V _S = ∓10 V; Test Circuit 2	
	±0.5	±50	±0.5	±50	nA max		
Drain OFF Leakage I _D (OFF)							
ADG428	±0.07	±0.7	±0.07	±0.7	nA typ	V _D = ±10 V, V _S = ∓10 V; Test Circuit 3	
	±1	±100	±1	±100	nA max		
ADG429	±0.05	±0.5	±0.05	±0.5	nA typ		
	±1	±50	±1	±50	nA max		
Channel ON Leakage I _D , I _S (ON)						V _S = V _D = ±10 V; Test Circuit 4	
ADG428	±1	±100	±1	±100	nA max		
ADG429	±1	±50	±1	±50	nA max		
DIGITAL INPUTS							
Input High Voltage, V _{INH}	2.4		2.4		V min	V _{IN} = 0 or V _{DD} f = 1 MHz	
Input Low Voltage, V _{INL}	0.8		0.8		V max		
Input Current							
I _{INL} or I _{INH}	±0.1	±1	±0.1	±1	μA max		
C _{IN} , Digital Input Capacitance	8		8		pF typ		
DYNAMIC CHARACTERISTICS ²							
t _{TRANSITION}	110		110		ns typ	R _L = 1 MΩ, C _L = 35 pF; V _{S1} = ±10 V, V _{S8} = ∓10 V; Test Circuit 5	
	250	300	250	300	ns max		
t _{OPEN}	10		10		ns min	R _L = 1 kΩ, C _L = 35 pF; V _S = +5 V; Test Circuit 6	
t _{ON} (EN, $\overline{WR}$)	115		115		ns typ		
	150	225	150	225	ns max	R _L = 1 kΩ, C _L = 35 pF; V _S = +5 V; Test Circuit 7	
t _{OFF} (EN, $\overline{RS}$)	105		105		ns typ		
	150	300	150	300	ns max	R _L = 1 kΩ, C _L = 35 pF; V _S = +5 V; Test Circuit 7	
t _W , Write Pulsewidth	100		100		ns min		
t _S , Address, Enable Setup Time	100		100		ns min		
t _H , Address, Enable Hold Time	10		10		ns min		
t _{RS} , Reset Pulsewidth	100		100		ns min	V _S = +5 V V _S = 0 V, R _S = 0 Ω, C _L = 10 nF; Test Circuit 10	
Charge Injection	4		4		pC typ		
OFF Isolation	−75		−75		dB typ	R _L = 1 kΩ, C _L = 15 pF, f = 100 kHz; V _S = 7 V rms, V _{EN} = 0 V; Test Circuit 11	
	−60		−60		dB min		
Channel-to-Channel Crosstalk	85		85		dB typ	R _L = 1 kΩ, C _L = 15 pF, f = 100 kHz; Test Circuit 12	
C _S (OFF)	11		11		pF typ		
C _D (OFF)						f = 1 MHz f = 1 MHz	
ADG428	40		40		pF typ		
ADG429	20		20		pF typ	f = 1 MHz	
C _D , C _S (ON)							
ADG428	54		54		pF typ		
ADG429	34		34		pF typ		
POWER REQUIREMENTS							
I _{DD}	20		20		μA typ	V _{IN} = 0 V, V _{EN} = 0 V	
	100		100		μA max		
I _{SS}	0.001		0.001		μA typ		
	5		5		μA max		

NOTES

¹Temperature ranges are as follows: B Version: −40°C to +85°C; T Version: −55°C to +125°C.

²Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

SINGLE SUPPLY¹ ($V_{DD} = +12\text{ V}$, $V_{SS} = 0\text{ V}$, $GND = 0\text{ V}$, $\overline{WR} = 0\text{ V}$, $\overline{RS} = 2.4\text{ V}$ unless otherwise noted)

Parameter	B Version		T Version		Units	Test Conditions/Comments
	+25°C	–40°C to +85°C	+25°C	–55°C to +125°C		
ANALOG SWITCH						
Analog Signal Range		0 to V _{DD}		0 to V _{DD}	V	
R _{ON}	90	200	90	200	Ω typ Ω max	V _D = +10 V, I _S = –500 μA
ΔR _{ON}	10		10		% max	0 V < V _S < 10 V, I _S = –1 mA
LEAKAGE CURRENTS						
Source OFF Leakage I _S (OFF)	±0.005 ±0.5	±50	±0.005 ±0.5	±50	nA typ nA max	V _D = 10 V/0 V, V _S = 0 V/10 V; Test Circuit 2
Drain OFF Leakage I _D (OFF)						V _D = 10 V/0 V, V _S = 0 V/10 V; Test Circuit 3
ADG428	±0.015 ±1	±100	±0.015 ±1	±100	nA typ nA max	
ADG429	±0.008 ±1	±50	±0.008 ±1	±50	nA typ nA max	
Channel ON Leakage I _D , I _S (ON)						V _S = V _D = 10 V/0 V; Test Circuit 4
ADG428	±0.02 ±1	±100	±0.02 ±1	±100	nA typ nA max	
ADG429	±0.01 ±1	±50	±0.01 ±1	±50	nA max nA max	
DIGITAL INPUTS						
Input High Voltage, V _{INH}		2.4		2.4	V min	
Input Low Voltage, V _{INL}		0.8		0.8	V max	
Input Current						
I _{INL} or I _{INH}		±1		±1	μA max	V _{IN} = 0 or V _{DD}
C _{IN} , Digital Input Capacitance	8		8		pF typ	f = 1 MHz
DYNAMIC CHARACTERISTICS ²						
t _{TRANSITION}	250 350	450	250 350	450	ns typ ns max	R _L = 1 MΩ, C _L = 35 pF; V _{S1} = 10 V/0 V, V _{S8} = 0 V/10 V; Test Circuit 5
t _{OPEN}	25	10	25	10	ns min	R _L = 1 kΩ, C _L = 35 pF; V _S = +5 V; Test Circuit 6
t _{ON} (EN, $\overline{WR}$)	200 300	400	200 300	400	ns typ ns max	R _L = 1 kΩ, C _L = 35 pF; V _S = +5 V; Test Circuit 7
t _{OFF} (EN, $\overline{RS}$)	80 300		80 300		ns typ ns max	R _L = 1 kΩ, C _L = 35 pF; V _S = +5 V; Test Circuit 7
t _W , Write Pulsewidth		100		100	ns min	
t _S , Address, Enable Setup Time		100		100	ns min	
t _H , Address, Enable Hold Time		10		10	ns min	
t _{RS} , Reset Pulsewidth		100		100	ns min	V _S = +5 V
Charge Injection	4		4		pC typ	V _S = 6 V, R _S = 0 Ω, C _L = 10 nF; Test Circuit 10
OFF Isolation	–75 –60		–75 –60		dB typ dB min	R _L = 1 kΩ, C _L = 15 pF, f = 100 kHz; V _S = 7 V rms, V _{EN} = 0 V; Test Circuit 11
Channel-to-Channel Crosstalk	85		85		dB typ	R _L = 1 kΩ, C _L = 15 pF, f = 100 kHz; Test Circuit 12
C _S (OFF)	11		11		pF typ	f = 1 MHz
C _D (OFF)						f = 1 MHz
ADG428	40		40		pF typ	
ADG429	20		20		pF typ	
C _D , C _S (ON)						f = 1 MHz
ADG428	54		54		pF typ	
ADG429	34		34		pF typ	
POWER REQUIREMENTS						
I _{DD}	20 100		20 100		μA typ μA max	V _{IN} = 0 V, V _{EN} = 0 V

NOTES

¹Temperature ranges are as follows: B Version: –40°C to +85°C; T Version: –55°C to +125°C.²Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

ADG428/ADG429

ABSOLUTE MAXIMUM RATINGS¹

(T_A = +25°C unless otherwise noted.)

V _{DD} to V _{SS}	+44 V
V _{DD} to GND	-0.3 V to +25 V
V _{SS} to GND	+0.3 V to -25 V
Analog, Digital Inputs ²	V _{SS} - 2 V to V _{DD} + 2 V or 30 mA, Whichever Occurs First
Continuous Current, S or D	30 mA
Peak Current, S or D (Pulsed at 1 ms, 10% Duty Cycle Max)	100 mA
Operating Temperature Range	
Industrial (B Version)	-40°C to +85°C
Extended (T Version)	-55°C to +125°C
Storage Temperature Range	-65°C to +150°C
Junction Temperature	+150°C
Cerdip Package, Power Dissipation	900 mW
θ _{JA} , Thermal Impedance	73°C/W
Lead Temperature, Soldering (10 sec)	+300°C
Plastic Package, Power Dissipation	470 mW
θ _{JA} , Thermal Impedance	115°C/W
Lead Temperature, Soldering (10 sec)	+260°C
SOIC Package, Power Dissipation	600 mW
θ _{JA} , Thermal Impedance	77°C/W
Lead Temperature, Soldering	
Vapor Phase (60 sec)	+215°C
PLCC Package, Power Dissipation	800 mW
θ _{JA} , Thermal Impedance	90°C/W
Lead Temperature, Soldering	
Vapor Phase (60 sec)	+215°C
Infrared (15 sec)	+220°C

NOTES

¹Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Only one absolute maximum rating may be applied at any one time.

²Overvoltages at A, EN, $\overline{WR}$, $\overline{RS}$, S or D will be clamped by internal diodes. Current should be limited to the maximum ratings given.

ORDERING GUIDE

Model ¹	Temperature Range	Package Options ²
ADG428BN	-40°C to +85°C	N-18
ADG428BP	-40°C to +85°C	P-20A
ADG428BR	-40°C to +85°C	R-18
ADG428TQ	-55°C to +125°C	Q-18
ADG429BN	-40°C to +85°C	N-18
ADG429BP	-40°C to +85°C	P-20A
ADG429TQ	-55°C to +125°C	Q-18

NOTES

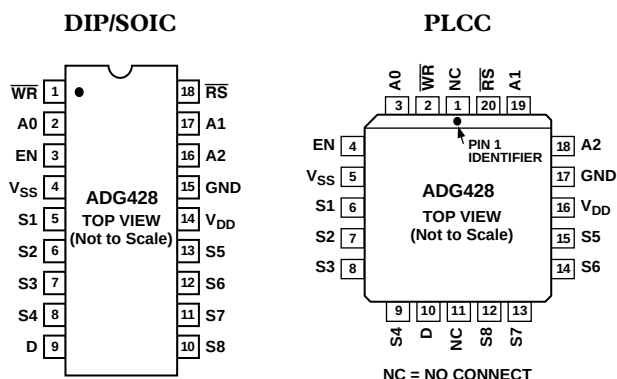
¹For availability of MIL-STD-883, Class B processed parts, contact factory.

²N = Plastic DIP; P = Plastic Leaded Chip Carrier (PLCC); Q = Cerdip;
R = Small Outline IC (SOIC).

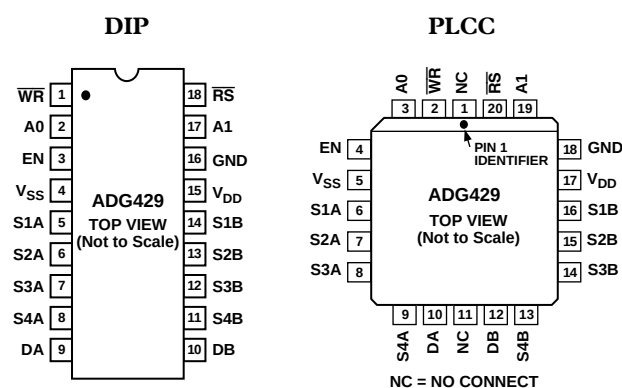
CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the ADG428/ADG429 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

ADG428 PIN CONFIGURATIONS



ADG429 PIN CONFIGURATIONS



TERMINOLOGY

V_{DD}	Most positive power supply potential.
V_{SS}	Most negative power supply potential in dual supplies. In single supply applications, it may be connected to ground.
GND	Ground (0 V) reference.
R_{ON}	Ohmic resistance between D and S.
ΔR_{ON}	Difference between the R_{ON} of any two channels.
I_S (OFF)	Source leakage current when the switch is off.
I_D (OFF)	Drain leakage current when the switch is off.
I_D, I_S (ON)	Channel leakage current when the switch is on.
V_D (V_S)	Analog voltage on terminals D, S.
C_S (OFF)	Channel input capacitance for “OFF” condition.
C_D (OFF)	Channel output capacitance for “OFF” condition.
C_D, C_S (ON)	“ON” switch capacitance.
C_{IN}	Digital input capacitance.
t_{ON} (EN)	Delay time between the 50% and 90% points of the digital input and switch “ON” condition.
t_{OFF} (EN)	Delay time between the 50% and 90% points of the digital input and switch “OFF” condition.
$t_{TRANSITION}$	Delay time between the 50% and 90% points of the digital inputs and the switch “ON” condition when switching from one address state to another.
t_{OPEN}	“OFF” time measured between 80% points of both switches when switching from one address state to another.
V_{INL}	Maximum input voltage for Logic “0.”
V_{INH}	Minimum input voltage for Logic “1.”
I_{INL} (I_{INH})	Input current of the digital input.
Crosstalk	A measure of unwanted signal which is coupled through from one channel to another as a result of parasitic capacitance.
Off Isolation	A measure of unwanted signal coupling through an “OFF” channel.
Charge Injection	A measure of the glitch impulse transferred from the digital input to the analog output during switching.
I_{DD}	Positive supply current.
I_{SS}	Negative supply current.

ADG428 Truth Table

A2	A1	A0	EN	$\overline{WR}$	$\overline{RS}$	ON SWITCH
Latching						
X	X	X	X	$\frac{1}{2}$	1	Maintains Previous Switch Condition
Reset						
X	X	X	X	X	0	NONE (Latches Cleared)
Transparent Operation						
X	X	X	0	0	1	NONE
0	0	0	1	0	1	1
0	0	1	1	0	1	2
0	1	0	1	0	1	3
0	1	1	1	0	1	4
1	0	0	1	0	1	5
1	0	1	1	0	1	6
1	1	0	1	0	1	7
1	1	1	1	0	1	8

ADG429 Truth Table

A1	A0	EN	$\overline{WR}$	$\overline{RS}$	ON SWITCH PAIR
Latching					
X	X	X	$\frac{1}{2}$	1	Maintains Previous Switch Condition
Reset					
X	X	X	X	0	NONE (Latches Cleared)
Transparent Operation					
X	X	0	0	1	NONE
0	0	1	0	1	1
0	1	1	0	1	2
1	0	1	0	1	3
1	1	1	0	1	4

ADG428/ADG429

TIMING DIAGRAMS

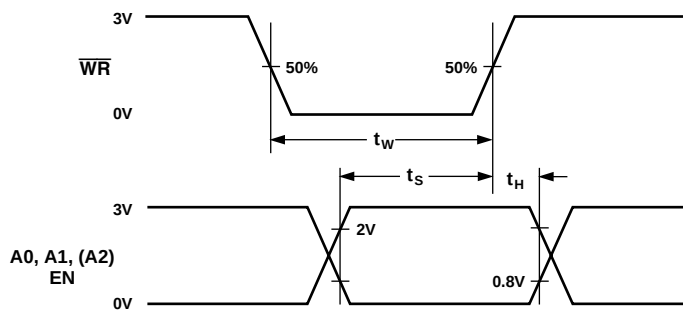


Figure 1.

Figure 1 shows the timing sequence for latching the switch address and enable inputs. The latches are level sensitive; therefore, while $\overline{WR}$ is held low, the latches are transparent and the switches respond to the address and enable inputs. This input data is latched on the rising edge of $\overline{WR}$.

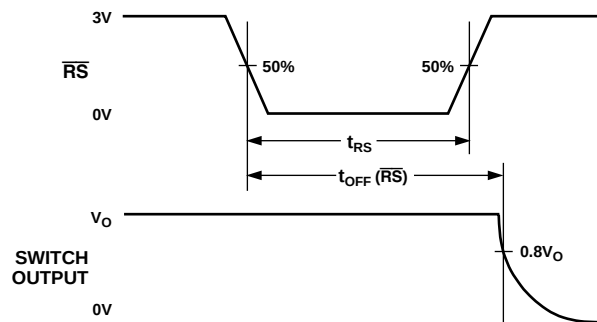


Figure 2.

Figure 2 shows the Reset Pulsewidth, t_{RS} , and the Reset Turnoff Time, $t_{OFF}(\overline{RS})$.

Note: All digital input signals rise and fall times are measured from 10% to 90% of 3 V. $t_r = t_f = 20$ ns.

Typical Characteristics

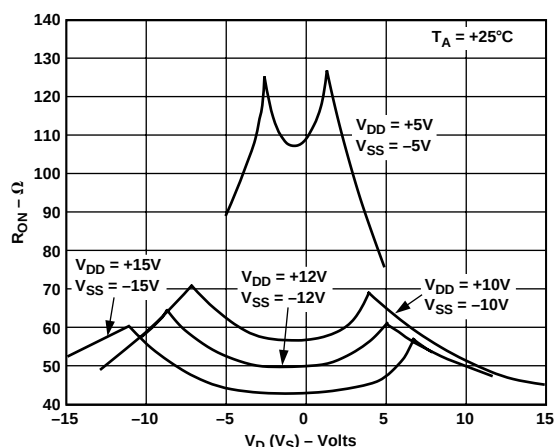


Figure 3. R_{ON} as a Function of V_D (V_S): Dual Supply Voltage

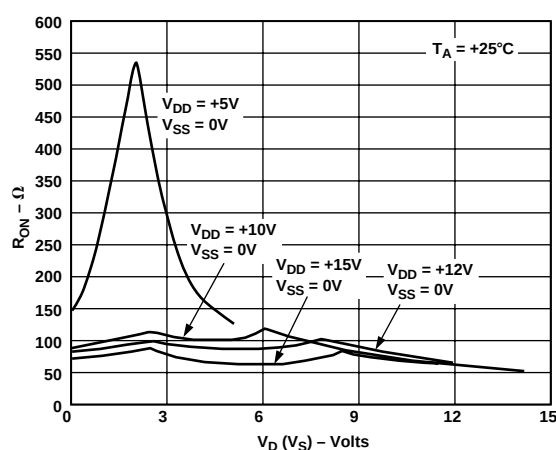


Figure 5. R_{ON} as a Function of V_D (V_S): Single Supply Voltage

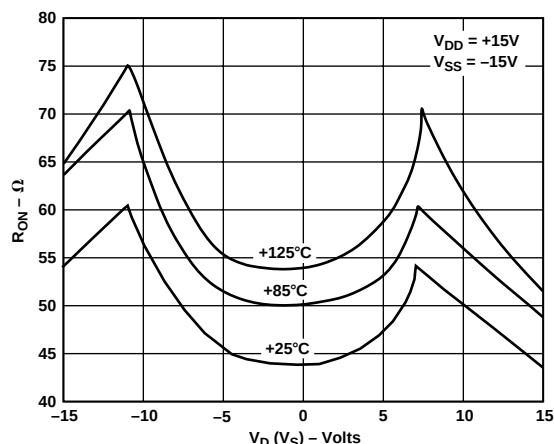


Figure 4. R_{ON} as a Function of V_D (V_S) for Different Temperatures

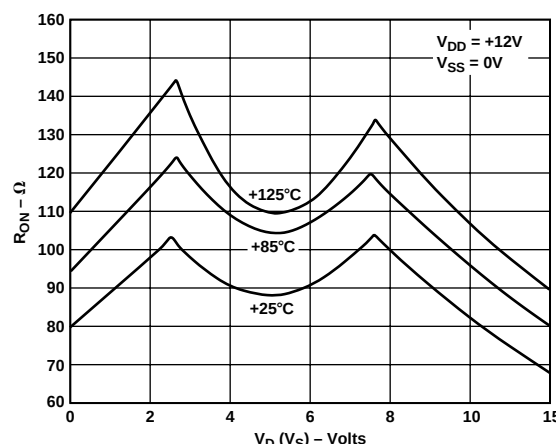


Figure 6. R_{ON} as a Function of V_D (V_S) for Different Temperatures

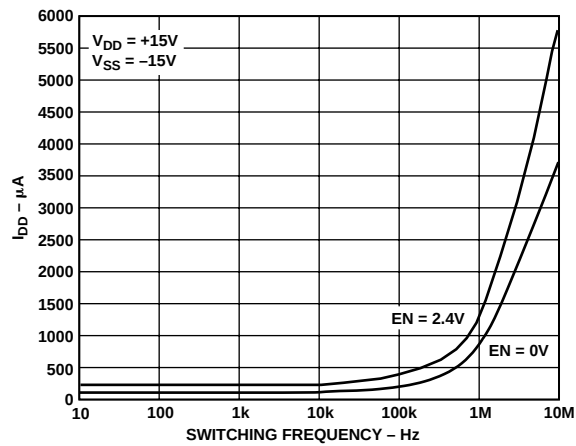


Figure 7. Positive Supply Current vs. Switching Frequency

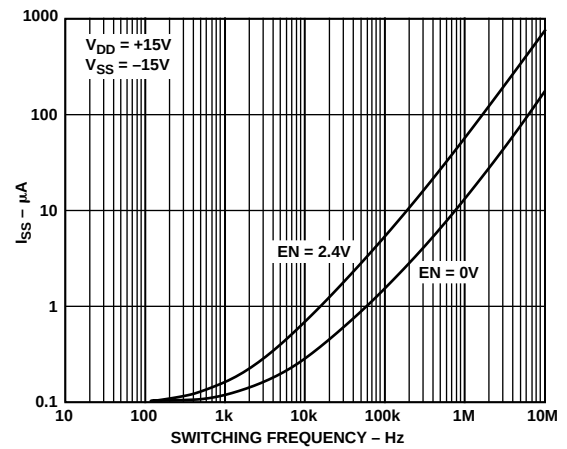


Figure 10. Negative Supply Current vs. Switching Frequency

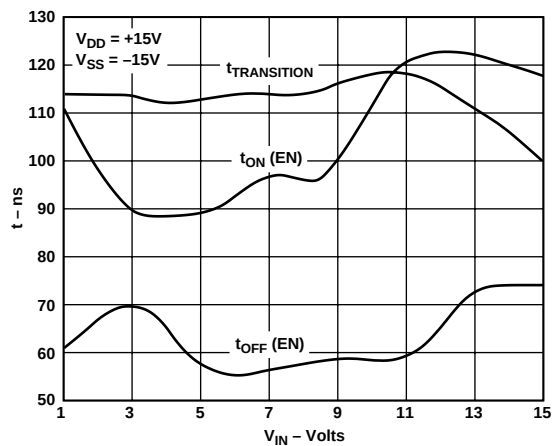


Figure 8. Switching Time vs. V_{IN} (Bipolar Supply)

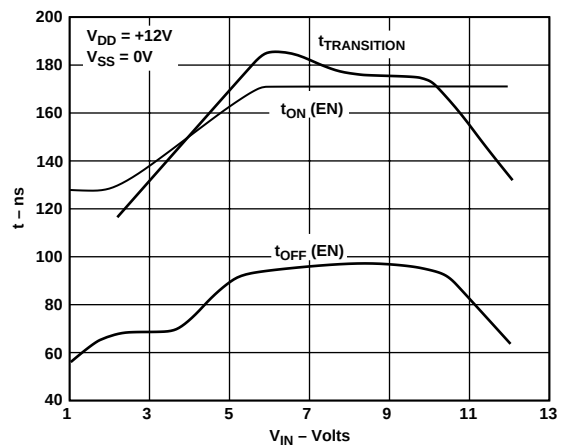


Figure 11. Switching Time vs. V_{IN} (Single Supply)

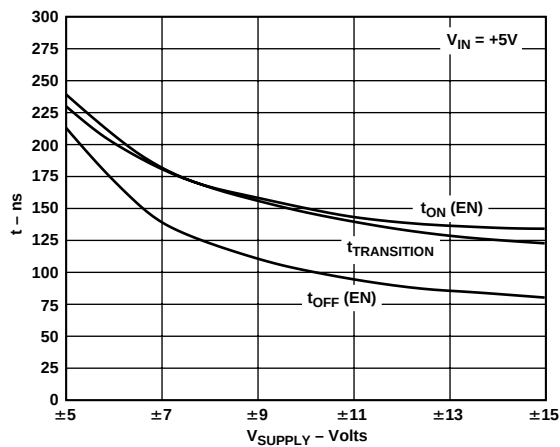


Figure 9. Switching Time vs. Bipolar Supply

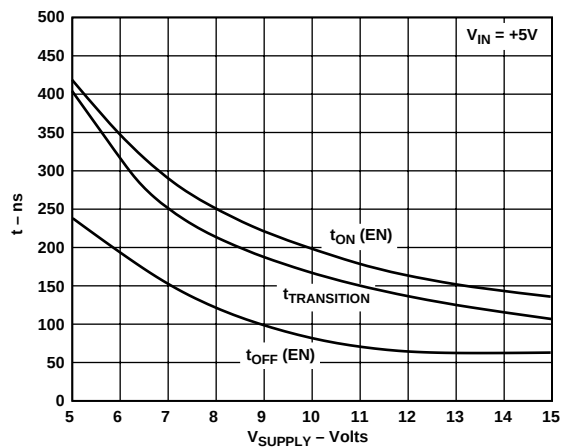


Figure 12. Switching Time vs. Single Supply

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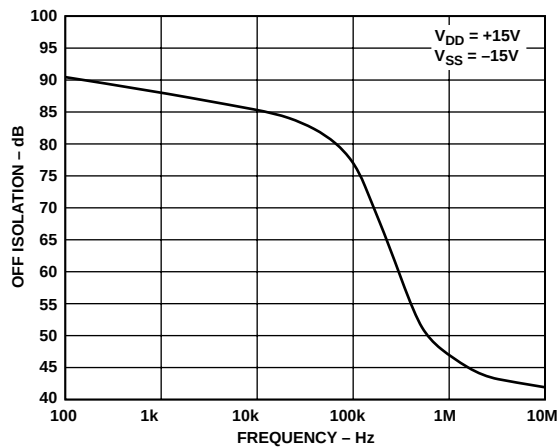


Figure 13. OFF Isolation vs. Frequency

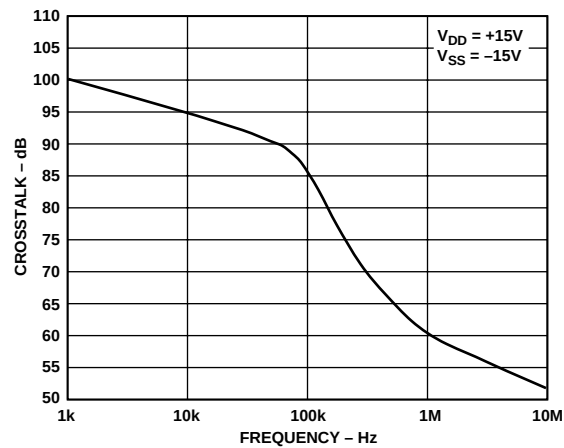


Figure 15. Crosstalk vs. Frequency

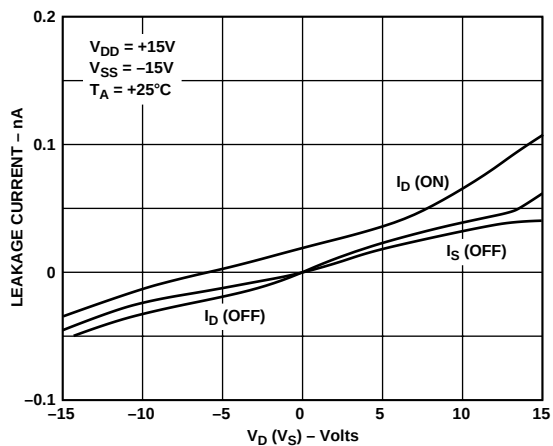


Figure 14. Leakage Currents as a Function of $V_D (V_S)$

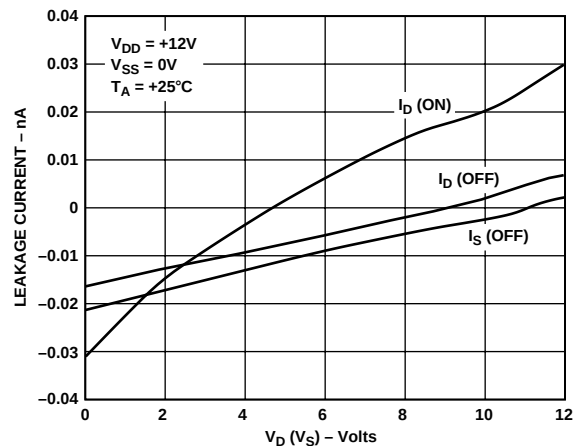
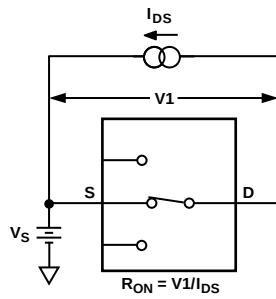
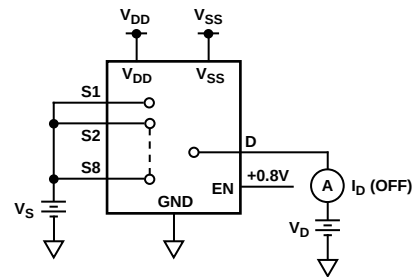


Figure 16. Leakage Currents as a Function of $V_D (V_S)$

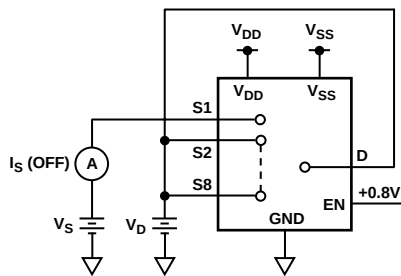
TEST CIRCUITS



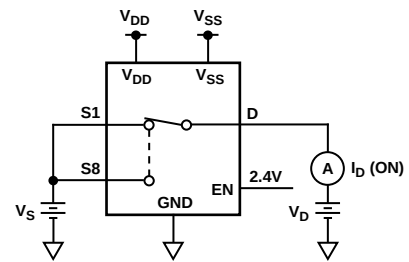
Test Circuit 1. On Resistance



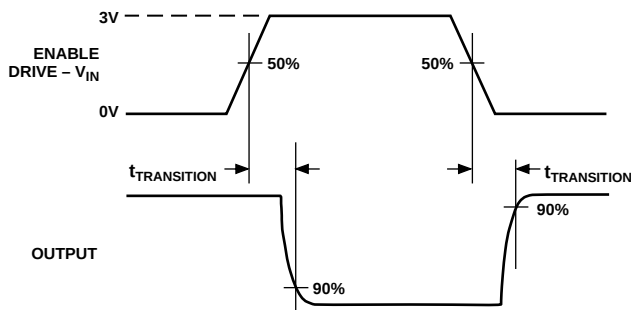
Test Circuit 3. I_D (OFF)



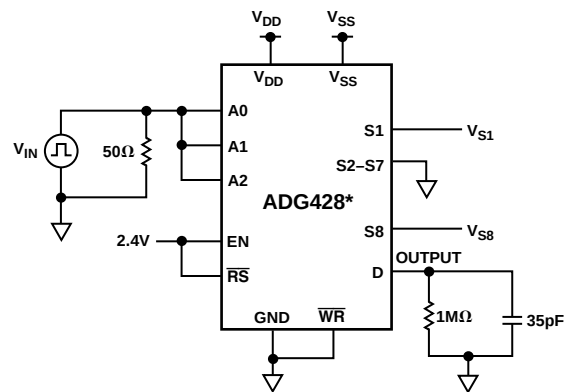
Test Circuit 2. I_S (OFF)



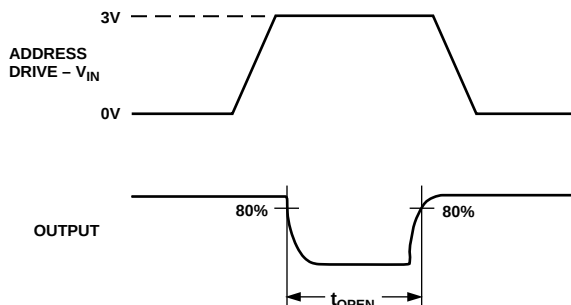
Test Circuit 4. I_D (ON)



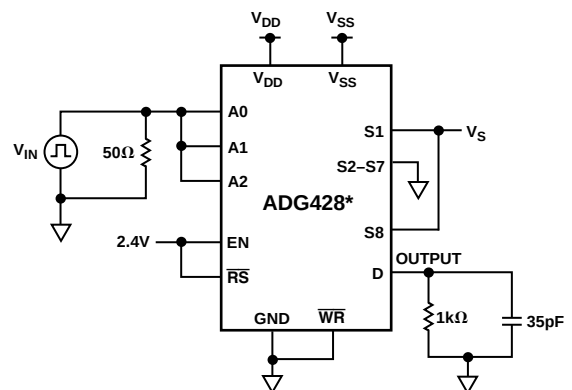
Test Circuit 5. Switching Time of Multiplexer, $t_{\text{TRANSITION}}$



*SIMILAR CONNECTION FOR ADG429

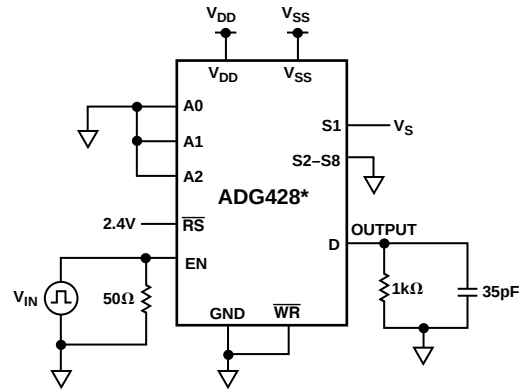
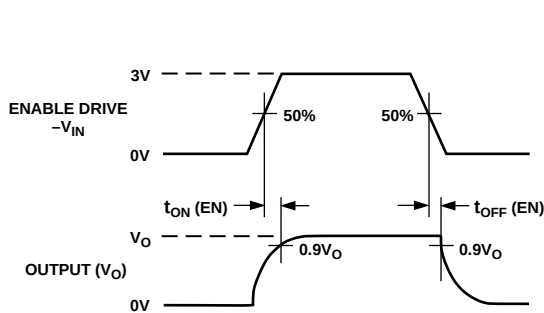


Test Circuit 6. Break-Before-Make Delay, t_{OPEN}



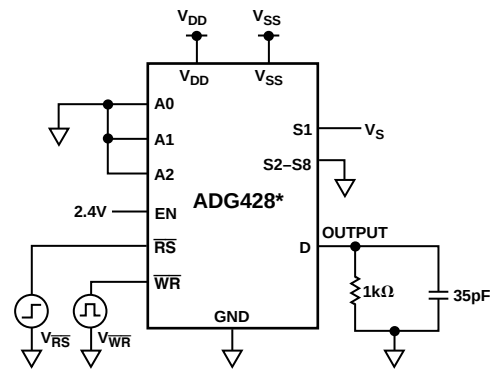
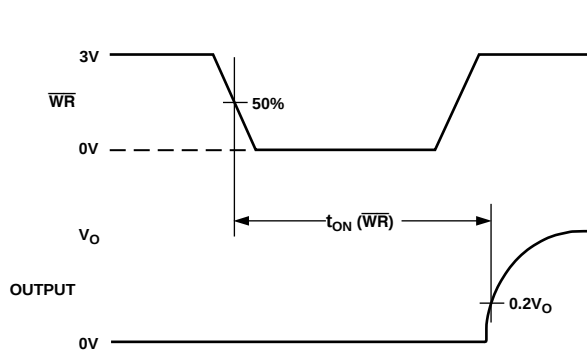
*SIMILAR CONNECTION FOR ADG429

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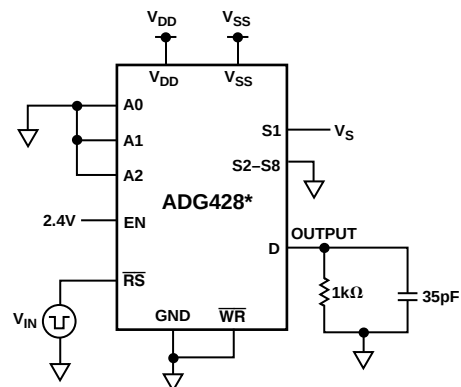
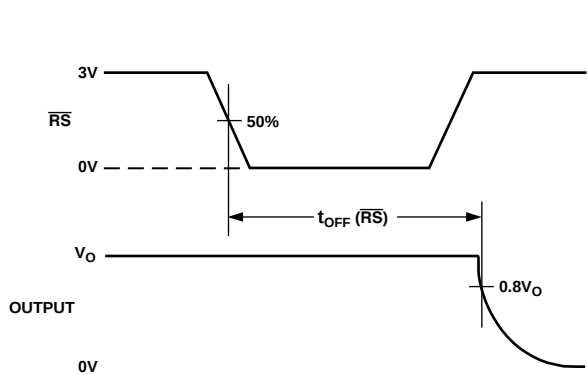
*SIMILAR CONNECTION FOR ADG429

Test Circuit 7. Enable Delay, $t_{ON}(EN)$, $t_{OFF}(EN)$



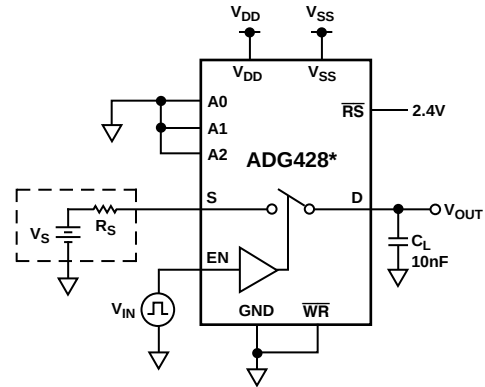
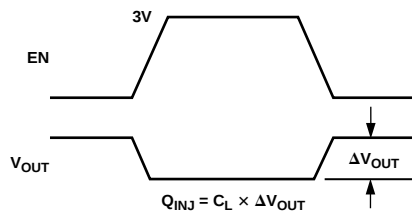
*SIMILAR CONNECTION FOR ADG429

Test Circuit 8. Write Turn-On Time, $t_{ON}(\overline{WR})$



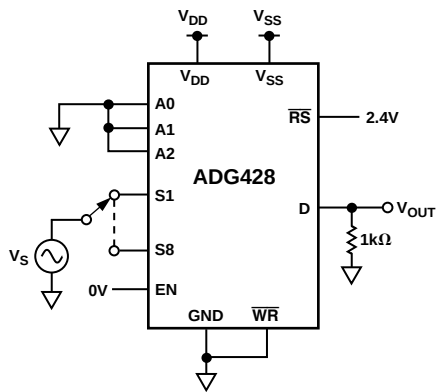
*SIMILAR CONNECTION FOR ADG429

Test Circuit 9. Reset Turn-Off Time, $t_{OFF}(\overline{RS})$

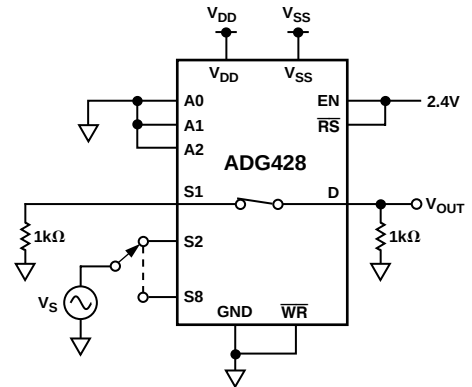


*SIMILAR CONNECTION FOR ADG429

Test Circuit 10. Charge Injection



Test Circuit 11. OFF Isolation



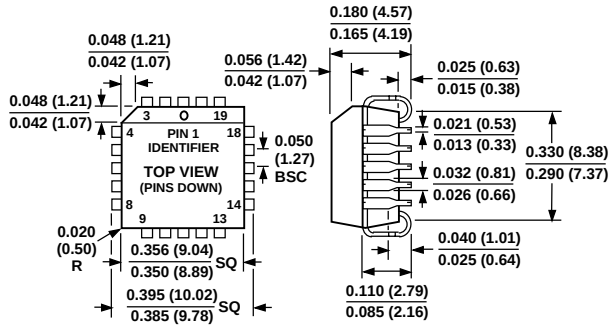
Test Circuit 12. Crosstalk

ADG428/ADG429

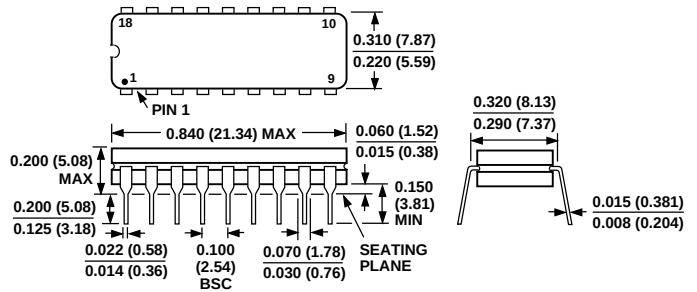
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

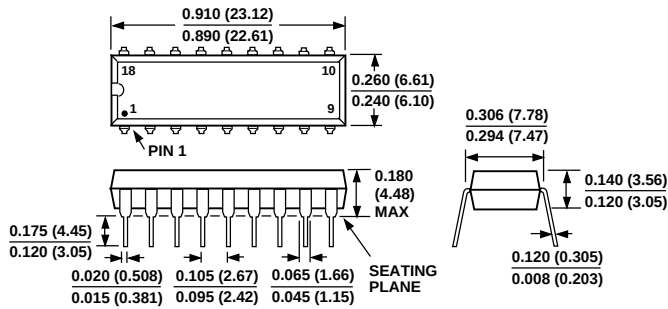
PLCC (P-20A)



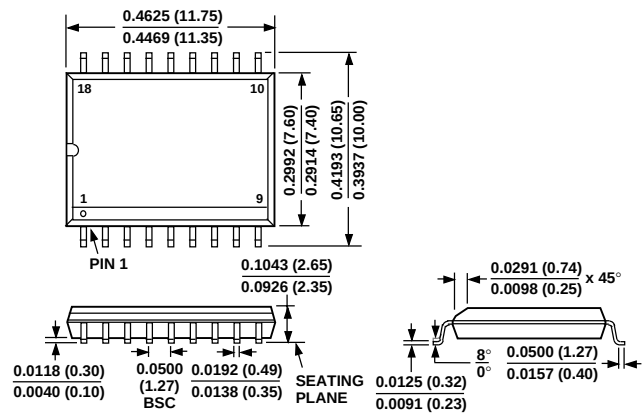
Cerdip (Q-18)



Plastic DIP (N-18)



SOIC (R-18)



C1825c-0-5/99

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