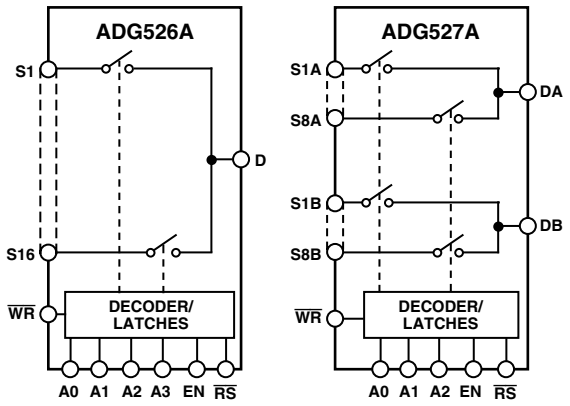
CMOS Latched 8-/16-Channel Analog Multiplexers

ADG526A/ADG527A

FEATURES

44 V Supply Maximum Rating
V_{SS} to V_{DD} Analog Signal Range
Single/Dual Supply Specifications
Wide Supply Ranges (10.8 V to 16.5 V)
Microprocessor Compatible (100 ns $\overline{WR}$ Pulse)
Extended Plastic Temperature Range (–40°C to +85°C)
Low Leakage (20 pA Typ)
Low Power Dissipation (28 mW Max)
Available in DIP, SOIC, PLCC, and LCCC Packages
Superior Alternative to: DG526, DG527

FUNCTIONAL BLOCK DIAGRAM



GENERAL DESCRIPTION

The ADG526A and ADG527A are CMOS monolithic analog multiplexers with 16 channels and dual 8 channels respectively. On-chip latches facilitate microprocessor interfacing. The ADG526A switches one of 16 inputs to a common output depending on the state of four binary addresses and an enable input. The ADG527A switches one of eight differential inputs to a common differential output depending on the state of three binary addresses and an enable input. Both devices have TTL and 5 V CMOS logic compatible digital inputs.

The ADG526A and ADG527A are designed on an enhanced LC^{2}MOS process which gives an increased signal capability of V_{SS} to V_{DD} and enables operation over a wide range of supply voltages. The devices can comfortably operate anywhere in the 10.8 V to 16.5 V single or dual supply range. These multiplexers also feature high switching speeds and low R_{ON}.

PRODUCT HIGHLIGHTS

1. Single/Dual Supply Specifications with a Wide Tolerance: The devices are specified in the 10.8 V to 16.5 V range for both single and dual supplies.
2. Easily Interfaced: The ADG526A and ADG527A can be easily interfaced with microprocessors. The $\overline{WR}$ signal latches the state of the Address control lines and the Enable line. The $\overline{RS}$ signal clears both the address and enable data in the latches resulting in no output (all switches off). $\overline{RS}$ can be tied to the microprocessor reset pin.
3. Extended Signal Range: The enhanced LC^{2}MOS processing results in a high breakdown and an increased analog signal range of V_{SS} to V_{DD}.
4. Break-Before-Make Switching: Switches are guaranteed break-before-make so that input signals are protected against momentary shorting.
5. Low Leakage: Leakage currents in the range of 20 pA make these multiplexers suitable for high precision circuits.

REV. B

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One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781/329-4700 **www.analog.com**
Fax: 781/326-8703 **© Analog Devices, Inc., 2002**

ADG526A/ADG527A–SPECIFICATIONS

Dual Supply (V_{DD} = +10.8 V to +16.5 V, V_{SS} = –10.8 V to –16.5 V unless otherwise noted.)

Parameter	ADG526A/ADG527A K Version 25°C	ADG526A/ADG527A K Version –40°C to +85°C	ADG526A/ADG527A B Version 25°C	ADG526A/ADG527A B Version –40°C to +85°C	ADG526A T Version 25°C	ADG526A T Version –55°C to +125°C	Unit	Comments
ANALOG SWITCH								
Analog Signal Range	V_{SS}	V_{SS}	V_{SS}	V_{SS}	V_{SS}	V_{SS}	V min	
	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V max	
R_{ON}	280		280		280		Ω typ	$-10\ V \le V_S \le +10\ V$, I_{DS} = 1 mA; Test Circuit 1
	450	600	450	600	450	600	Ω max	
	300	400	300	400			Ω max	V_{DD} = 15 V (±10%), V_{SS} = –15 V (±10%)
					300	400	Ω max	V_{DD} = 15 V (±5%), V_{SS} = –15 V (±5%)
R_{ON} Drift	0.6		0.6		0.6		%/°C typ	$-10\ V \le V_S \le +10\ V$, I_{DS} = 1 mA
R_{ON} Match	5		5		5		% typ	$-10\ V \le V_S \le +10\ V$, I_{DS} = 1 mA
I_S (OFF), Off Input Leakage	0.02		0.02		0.02		nA typ	V1 = ±10 V, V2 = ∓10 V; Test Circuit 2
	1	50	1	50	1	50	nA max	
I_D (OFF), Off Output Leakage	0.04		0.04		0.04		nA typ	V1 = ±10 V, V2 = ∓10 V, Test Circuit 3
ADG526A	1	200	1	200	1	200	nA max	
ADG527A	1	100	1	100			nA max	
I_D (ON), On Channel Leakage	0.04		0.04		0.04		nA typ	V1 = ±10 V, V2 = ∓10 V; Test Circuit 4
ADG526A	1	200	1	200	1	200	nA max	
ADG527A	1	100	1	100			nA max	
I_{DIFF}, Differential Off Output Leakage (ADG527A Only)		25		25			nA max	V1 = ±10 V, V2 = ∓10 V; Test Circuit 5
DIGITAL CONTROL								
V_{INH}, Input High Voltage		2.4		2.4		2.4	V min	
V_{INL}, Input Low Voltage		0.8		0.8		0.8	V max	
I_{INL} or I_{INH}		1		1		1	µA max	V_{IN} = 0 to V_{DD}
C_{IN} Digital Input Capacitance	8		8		8		pF max	
DYNAMIC CHARACTERISTICS*								
$t_{TRANSITION}$	200		200		200		ns typ	V1 = ±10 V, V2 = ∓10 V; Test Circuit 6
	300	400	300	400	300	400	ns max	
t_{OPEN}	50		50		50		ns typ	Test Circuit 7
	25	10	25	10	25	10	ns min	
t_{ON} (EN, $\overline{WR}$)	200		200		200		ns typ	Test Circuit 8 and 9
	300	400	300	400	300	400	ns max	
t_{OFF} (EN, $\overline{RS}$)	200		200		200		ns typ	Test Circuit 8 and 10
	300	400	300	400	300	400	ns max	
t_W Write Pulsewidth	100	120	100	120	100	130	ns min	See Figure 1
t_S Address Enable Setup Time		100		100		100	ns min	See Figure 1
t_H Address Enable Hold Time		10		10		10	ns min	See Figure 1
t_{RS} Reset Pulsewidth		100		100		100	ns min	See Figure 2
OFF Isolation	68		68		68		dB typ	V_{EN} = 0.8 V, R_L = 1 kΩ, C_L = 15 pF, V_S = 7 V rms, f = 100 kHz
	50		50		50		dB min	V_S = 7 V rms, f = 100 kHz
C_S (OFF)	5		5		5		pF typ	V_{EN} = 0.8 V
C_D (OFF)								
ADG526A	44		44		44		pF typ	V_{EN} = 0.8 V
ADG527A	22		22				pF typ	
Q_{INJ}, Charge Injection	4		4		4		pC typ	R_S = 0 Ω, V_S = 0 V; Test Circuit 11
POWER SUPPLY								
I_{DD}	0.6		0.6		0.6		mA typ	V_{IN} = V_{INL} or V_{INH}
		1.5	1.5			1.5	mA max	
I_{SS}	20		20		20		µA typ	V_{IN} = V_{INL} or V_{INH}
		0.2	0.2			0.2	mA max	
Power Dissipation	10		10		10		mW typ	
		28		28		28	mW max	

*Sample tested at 25°C to ensure compliance.

Specifications subject to change without notice.

Single Supply (V_{DD} = 10.8 V to 16.5 V, V_{SS} = GND to 0 V unless otherwise noted.)

Parameter	ADG526A/ADG527A K Version 25°C	ADG526A/ADG527A K Version −40°C to +85°C	ADG526A/ADG527A B Version 25°C	ADG526A/ADG527A B Version −40°C to +85°C	ADG526A T Version 25°C	ADG526A T Version −55°C to +125°C	Unit	Comments
ANALOG SWITCH								
Analog Signal Range	V_{SS}	V_{SS}	V_{SS}	V_{SS}	V_{SS}	V_{SS}	V min	
	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V max	
R_{ON}	500		500		500		Ω typ	0 V ≤ V_S ≤ 10 V, I_{DS} = 0.5 mA; Test Circuit 1
	700	1000	700	1000	700	1000	Ω max	
R_{ON} Drift	0.6		0.6		0.6		%/°C typ	0 V ≤ V_S ≤ 10 V, I_{DS} = 0.5 mA
R_{ON} Match	5		5		5		% typ	0 V ≤ V_S ≤ 10 V, I_{DS} = 0.5 mA
I_S(OFF), Off Input Leakage	0.02		0.02		0.02		nA typ	V1 = 10 V/0 V, V2 = 0 V/10 V; Test Circuit 2
	1	50	1	50	1	50	nA max	
I_D (OFF), Off Output Leakage	0.04		0.04		0.04		nA typ	V1 = 10 V/0 V, V2 = 0 V/10 V; Test Circuit 3
ADG526A	1	200	1	200	1	200	nA max	
ADG527A	1	100	1	100			nA max	
I_D (ON), On Channel Leakage	0.04		0.04		0.04		nA typ	V1 = 10 V/0 V, V2 = 0 V/10 V; Test Circuit 4
ADG526A	1	200	1	200	1	200	nA max	
ADG527A	1	100	1	100			nA max	
I_{DIFF}, Differential Off Output Leakage (ADG527A only)		25		25			nA max	V1 = 10 V/0 V, V2 = 0 V/10 V; Test Circuit 5
DIGITAL CONTROL								
V_{INH}, Input High Voltage		2.4		2.4		2.4	V min	
V_{INL}, Input Low Voltage		0.8		0.8		0.8	V max	
I_{INL} or I_{INH}		1		1		1	µA max	V_{IN} = 0 to V_{DD}
C_{IN} Digital Input Capacitance	8		8		8		pF max	
DYNAMIC CHARACTERISTICS*								
$t_{TRANSITION}$	300		300		300		ns typ	V1 = 10 V/0 V, V2 = 0 V/10 V;
	450	600	450	600	450	600	ns max	Test Circuit 6
t_{OPEN}	50		50		50		ns typ	Test Circuit 7
	25	10	25	10	25	10	ns min	
t_{ON} (EN, $\overline{WR}$)	250		250		250		ns typ	Test Circuits 8 and 9
	450	600	450	600	450	600	ns max	
t_{OFF} (EN, $\overline{RS}$)	250		250		250		ns typ	Test Circuits 8 and 10
	450	600	450	600	450	600	ns max	
t_W Write Pulsewidth	100	120	100	120	100	130	ns min	See Figure 1
t_S Address Enable Setup Time		100		100		100	ns min	See Figure 1
t_H Address Enable Hold Time		10		10		10	ns min	See Figure 1
t_{RS} Reset Pulsewidth		100		100		100	ns min	See Figure 2
OFF Isolation	68		68		68		dB typ	V_{EN} = 0.8 V, R_L = 1 kΩ, C_L = 15 pF
	50		50		50		dB min	V_S = 3.5 V rms, f = 100 kHz
C_S (OFF)	5		5		5		pF typ	V_{EN} = 0.8 V
C_D (OFF)								
ADG526A	44		44		44		pF typ	V_{EN} = 0.8 V
ADG527A	22		22				pF typ	
Q_{INJ}, Charge Injection	4		4		4		pC typ	R_S = 0 Ω, V_S = 0 V; Test Circuit 11
POWER SUPPLY								
I_{DD}	0.6		0.6		0.6		mA typ	V_{IN} = V_{INL} or V_{INH}
		1.5		1.5		1.5	mA max	
Power Dissipation	11		11		11		mW typ	
		25		25		25	mW max	

*Sample tested at 25°C to ensure compliance.

Specifications subject to change without notice.

TIMING DIAGRAMS

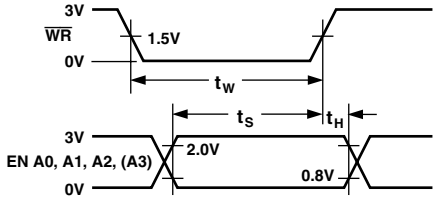


Figure 1.

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 $\overline{WR}$.

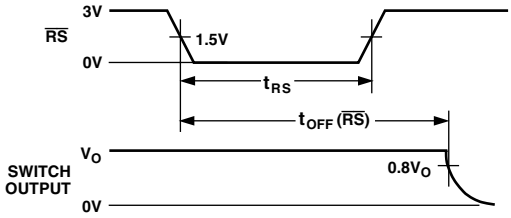


Figure 2.

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

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

ABSOLUTE MAXIMUM RATINGS[1]

(T_A = 25°C unless otherwise noted.)

V_{DD} to V_{SS} . . . . . 44 V
V_{DD} to GND . . . . . 25 V
V_{SS} to GND . . . . . –25 V
Analog Inputs[2]
Voltage at S, D . . . . . V_{SS} – 2 V to V_{DD} + 2 V
. . . . . or 20 mA, Whichever Occurs First
Continuous Current, S or D . . . . . 20 mA
Pulsed Current S or D
1 ms Duration, 10% Duty Cycle . . . . . 40 mA
Digital Inputs[2]
Voltage at A, EN, $\overline{WR}$, $\overline{RS}$ . . . . . V_{SS} – 4 V to V_{DD} + 4 V
. . . . . or 20 mA, Whichever Occurs First
Power Dissipation (Any Package)
Up to 75°C by . . . . . 470 mW
Derates above 75°C by . . . . . 6 mW/°C
Operating Temperature
Commercial (K Version) . . . . . –40°C to +85°C
Industrial (B Version) . . . . . –40°C to +85°C
Extended (T Version) . . . . . –55°C to +125°C
Storage Temperature Range . . . . . –65°C to +150°C
Lead Temperature (Soldering, 10 sec) . . . . . 300°C

NOTES
[1]Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating condition for extended periods may affect device reliability.
[2]Overvoltage at A, EN, $\overline{WR}$, $\overline{RS}$, S, or D will be clamped by diodes. Current should be limited to the maximum rating above.

ORDERING GUIDE

Model[1]	Temperature Range	Package Option[2]
ADG526AKN	–40°C to +85°C	N-28
ADG526AKR	–40°C to +85°C	R-28
ADG526AKP	–40°C to +85°C	P-28A
ADG526ABQ	–40°C to +85°C	Q-28
ADG526ATQ[3]	–55°C to +125°C	Q-28
ADG526ATE[3]	–55°C to +125°C	E-28A
ADG527AKN	–40°C to +85°C	N-28
ADG527AKR	–40°C to +85°C	R-28
ADG527AKP	–40°C to +85°C	P-28A
ADG527ABQ	–40°C to +85°C	Q-28

NOTES
[1]To order MIL-STD-883, Class B processed parts, add /883B to part number. See Analog Devices Military Products Databook (1990) for military data.
[2]E = Leadless Ceramic Chip Carrier; N = Narrow Plastic DIP; P = Plastic Leaded Chip Carrier; Q = CERDIP; R = 0.3" Small Outline IC (SOIC).
[3]Standard Military Drawing (SMD) assigned by DESC. SMD numbers are:
5962-89710013X (ADG526ATE/883B)
5962-8971001XX (ADG526ATQ/883B)

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 ADG526A/ADG527A 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.

TRUTH TABLES

ADG526A

A3	A2	A1	A0	EN	$\overline{WR}$	$\overline{RS}$	ON SWITCH
X	X	X	X	X	↓	1	Retains Previous Switch Condition
X	X	X	X	X	X	0	NONE (Address and Enable Latches Cleared)
X	X	X	X	0	0	1	NONE
0	0	0	0	1	0	1	1
0	0	0	1	1	0	1	2
0	0	1	0	1	0	1	3
0	0	1	1	1	0	1	4
0	1	0	0	1	0	1	5
0	1	0	1	1	0	1	6
0	1	1	0	1	0	1	7
0	1	1	1	1	0	1	8
1	0	0	0	1	0	1	9
1	0	0	1	1	0	1	10
1	0	1	0	1	0	1	11
1	0	1	1	1	0	1	12
1	1	0	0	1	0	1	13
1	1	0	1	1	0	1	14
1	1	1	0	1	0	1	15
1	1	1	1	1	0	1	16

X = Don't Care

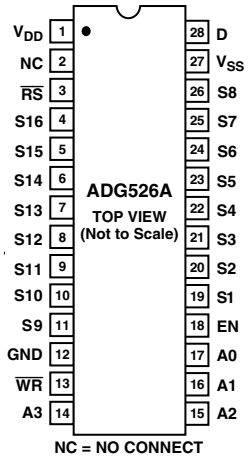
ADG527A

A2	A1	A0	EN	$\overline{WR}$	$\overline{RS}$	ON SWITCH PAIR
X	X	X	X	↓	1	Retains Previous Switch Condition
X	X	X	X	X	0	NONE (Address and Enable Latches Cleared)
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

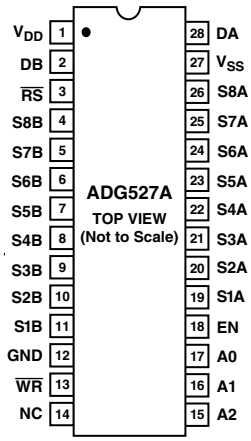
X = Don't Care

PIN CONFIGURATIONS

DIP, SOIC

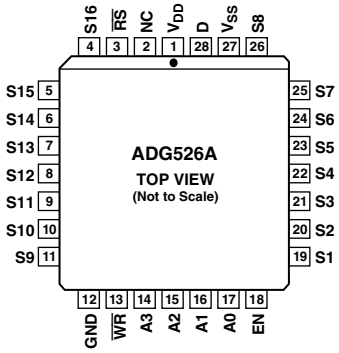


NC = NO CONNECT



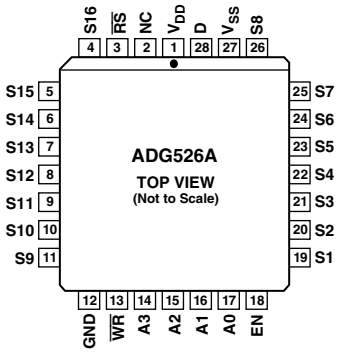
NC = NO CONNECT

LCCC

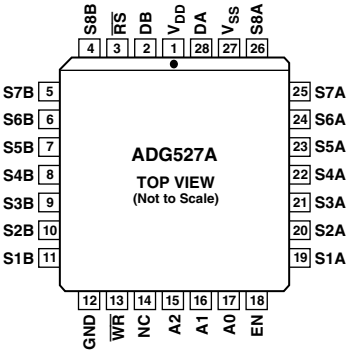


NC = NO CONNECT

PLCC

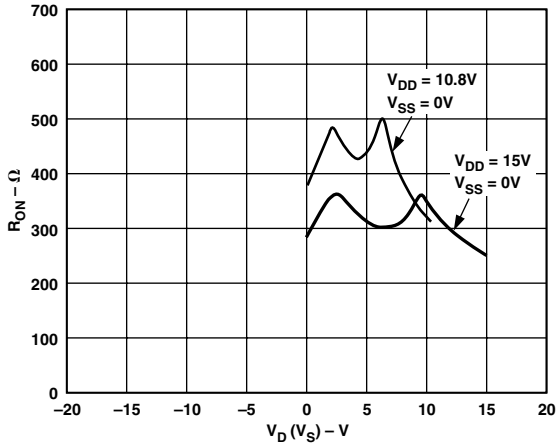


NC = NO CONNECT

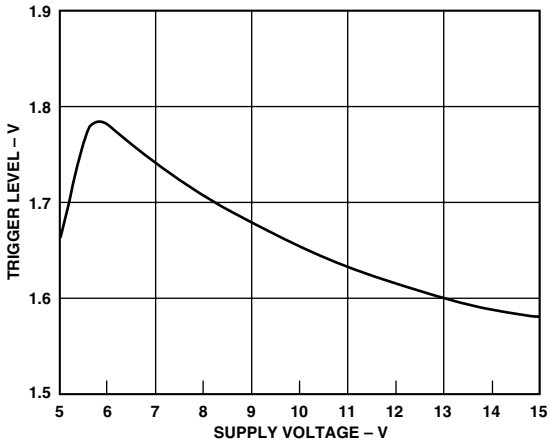


NC = NO CONNECT

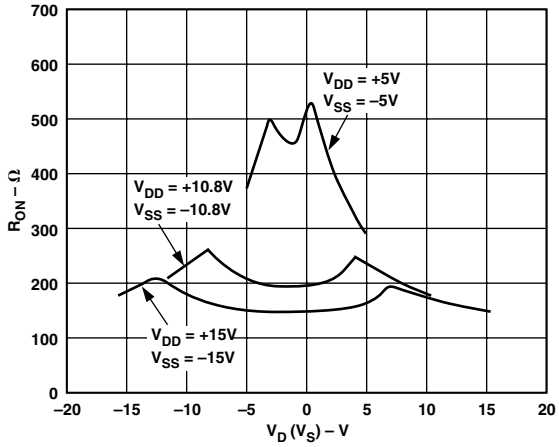
The multiplexers are guaranteed functional with reduced single or dual supplies down to 4.5 V.



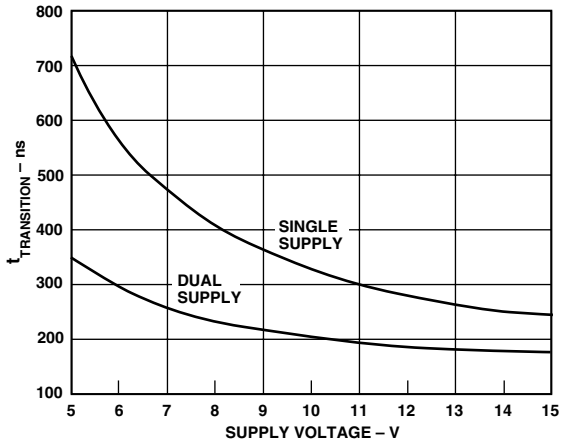
TPC 1. R_{ON} as a Function of V_D (V_S): Dual Supply Voltage, T_A = 25°C



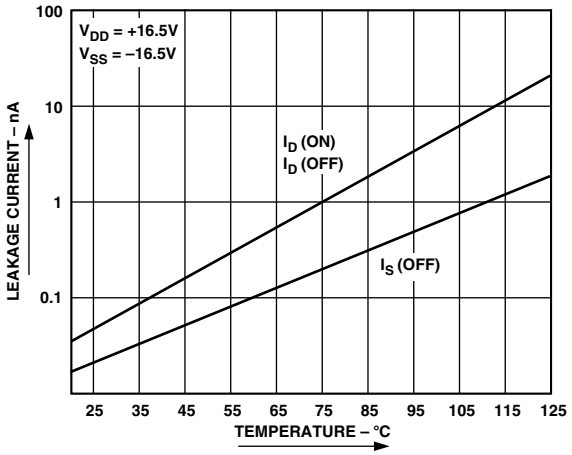
TPC 4. Trigger Levels vs. Power Supply Voltage, Dual or Single Supply, T_A = 25°C



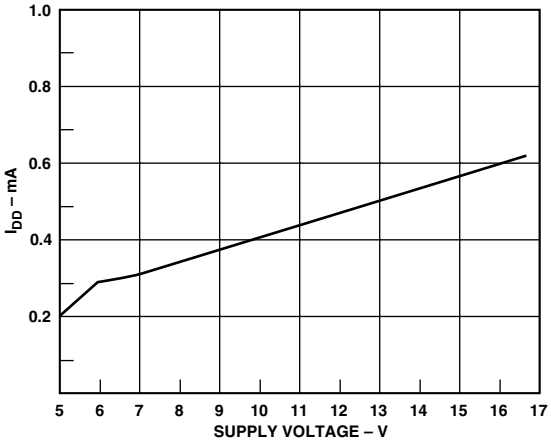
TPC 2. R_{ON} as a Function of V_D (V_S); Single Supply Voltage, T_A = 25°C



TPC 5. $t_{TRANSITION}$ vs. Supply Voltage: Dual and Single Supplies, T_A = 25°C (Note: For V_{DD} and / V_{SS} / <10 V; V1 = V_{DD}/V_{SS}, V2 = V_{SS}/V_{DD}; See Test Circuit 6)

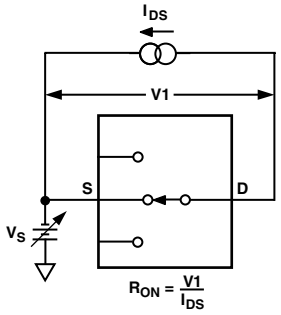


TPC 3. Leakage Current as a Function of Temperature (Note: Leakage Currents Reduce as the Supply Voltages Reduce)

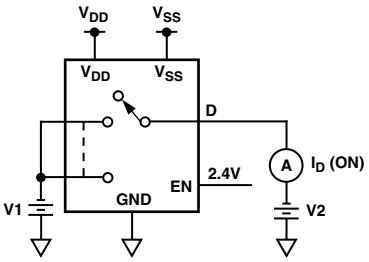


TPC 6. I_{DD} vs. Supply Voltage: Dual or Single Supply, T_A = 25°C

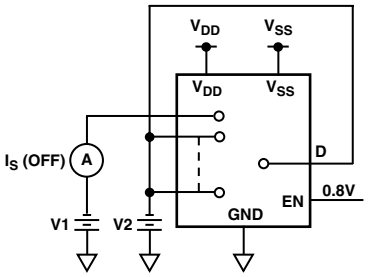
ADG526A/ADG527A–Test Circuits



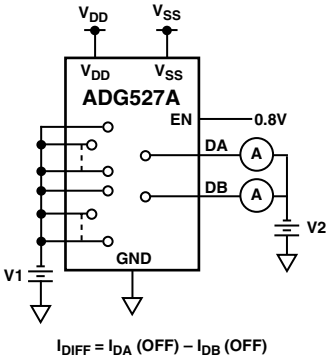
Test Circuit 1. R_{ON}



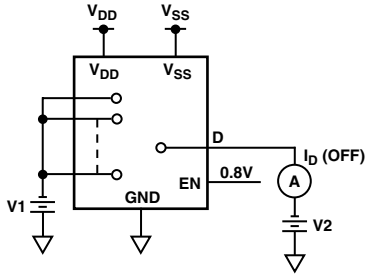
Test Circuit 4. I_D (ON)



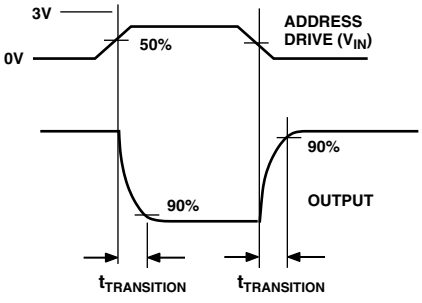
Test Circuit 2. I_S (OFF)

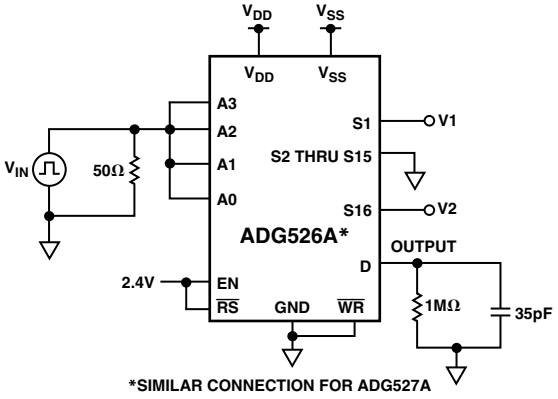


Test Circuit 5. I_{DIFF}

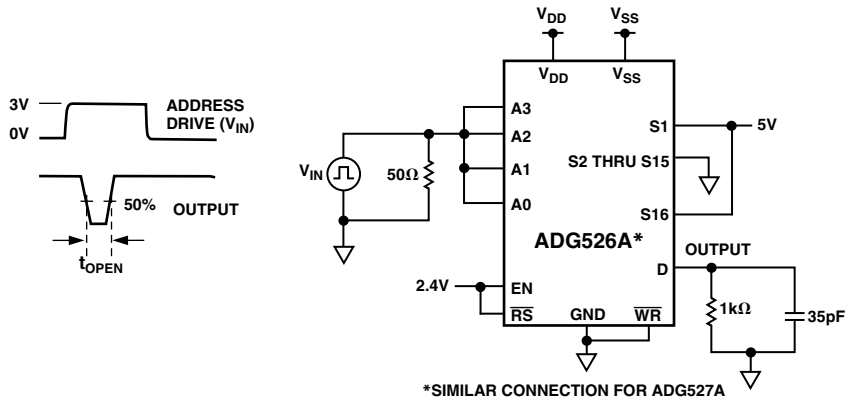


Test Circuit 3. I_D (OFF)

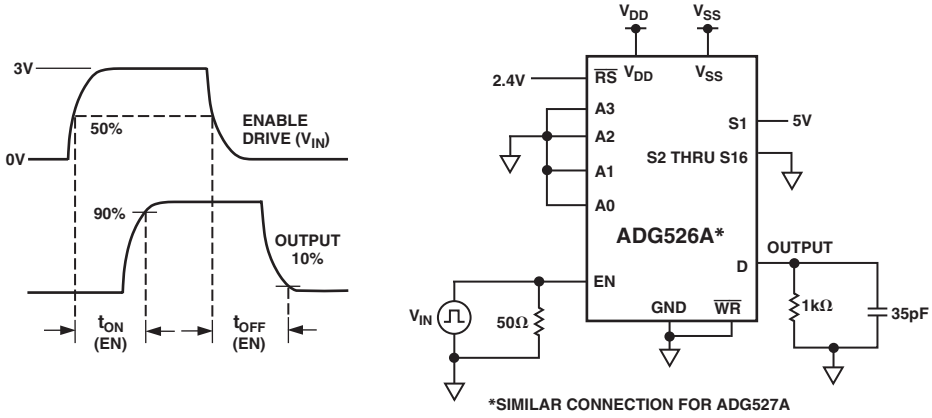




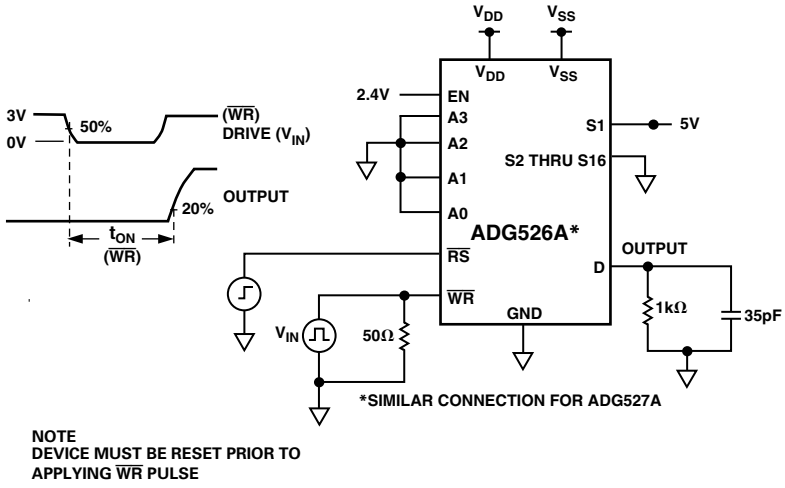
Test Circuit 6. Switching Time of Multiplexer, $t_{TRANSITION}$



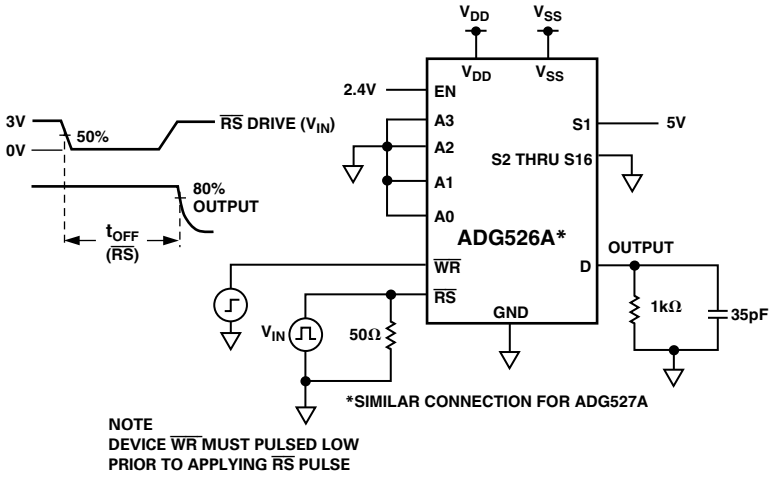
Test Circuit 7. Break-Before-Make Delay, t_{OPEN}



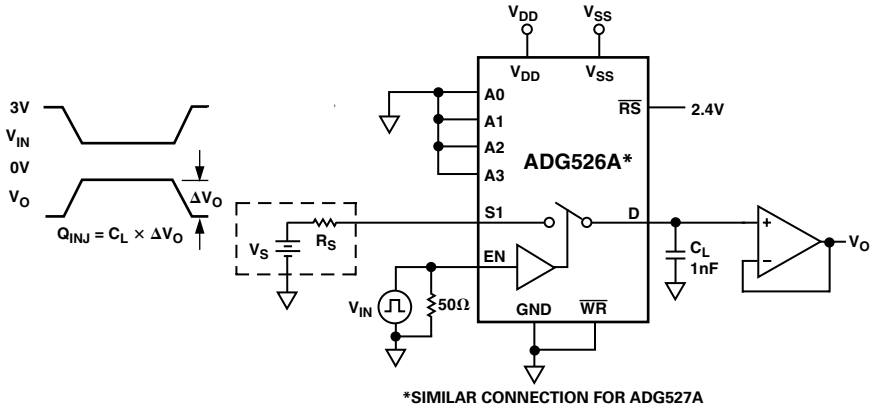
Test Circuit 8. Enable Delay, t_{ON} (EN), t_{OFF} (EN)



Test Circuit 9. Write Turn-On Time, t_{ON} ($\overline{WR}$)



Test Circuit 10. Reset Turn-Off Time, t_{OFF} ($\overline{RS}$)



Test Circuit 11. Charge Injection

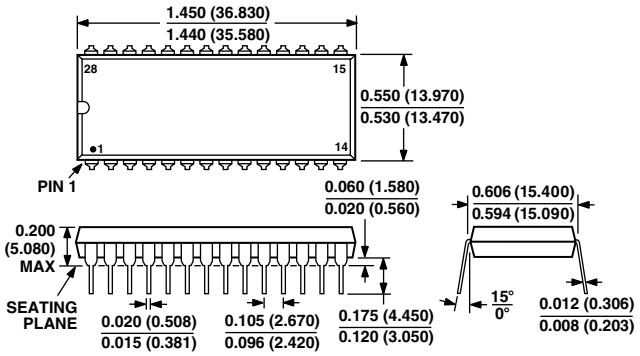
TERMINOLOGY

R_{ON}	Ohmic resistance between terminals D and S
R_{ON} Match	Difference between the R_{ON} of any two channels
R_{ON} Drift	Change in R_{ON} versus temperature
I_S (OFF)	Source terminal leakage current when the switch is off
I_D (OFF)	Drain terminal leakage current when the switch is off
I_D (ON)	Leakage current that flows from the closed switch into the body
V_S (V_D)	Analog voltage on terminal S or D
C_S (OFF)	Channel input capacitance for "OFF' condition
C_D (OFF)	Channel output capacitance for "OFF" condition
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 10% points of the digital input and switch "OFF" condition
$t_{TRANSITION}$	Delay time between the 50% and 90% points of the digital inputs and switch "ON" condition when switching from one address state to another
t_{OPEN}	"OFF" time measured between 50% 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
V_{DD}	Most positive voltage supply
V_{SS}	Most negative voltage supply
I_{DD}	Positive supply current
I_{SS}	Negative supply current

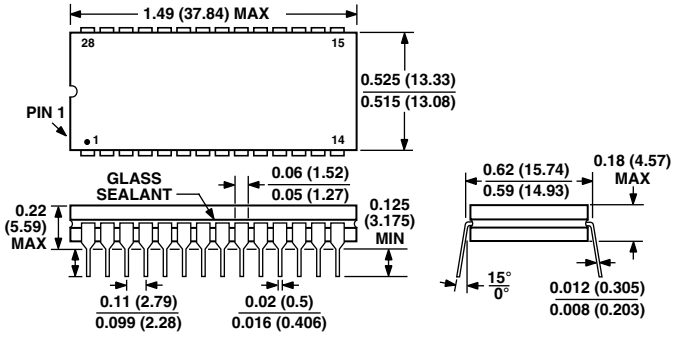
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

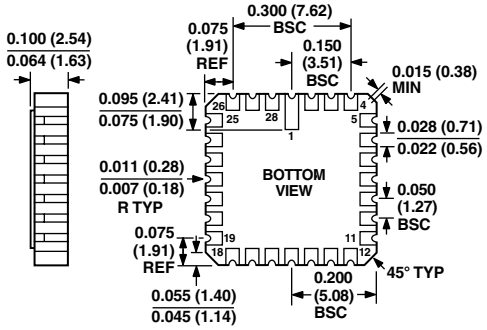
28-Lead Plastic DIP (Suffix N)
(N-28)



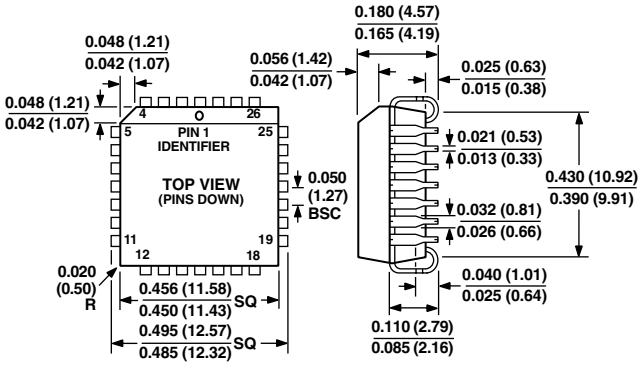
28-Lead Cerdip (Suffix Q)
(Q-28)



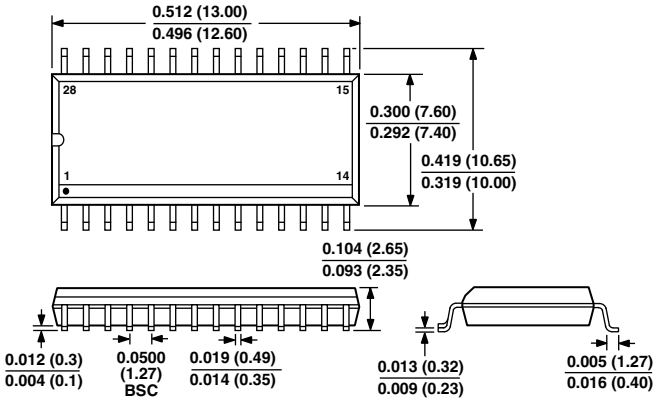
28-Terminal Leadless Ceramic Chip Carrier (Suffix E)
(E-28A)



28-Terminal Plastic Leaded Chip Carrier (Suffix P)
(P-28A)



28-Lead SOIC (R) Package
(R-28)



Revision History

Location	Page
Data Sheet changed from REV. A to REV. B.	
Edits to Specifications Table, Dual Supply	2
Edits to Specifications Table, Single Supply	3
Edits to ORDERING GUIDE	4
Removal of one PIN CONFIGURATION and diagram	6

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