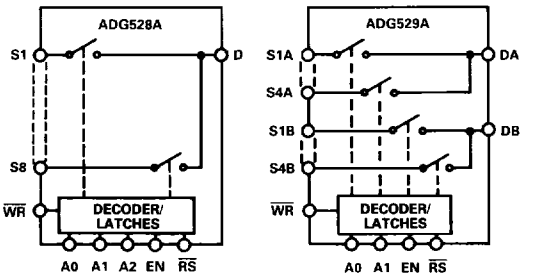
ANALOG DEVICES

CMOS Latched 4/8 Channel Analog Multiplexers

ADG528A/ADG529A

FEATURES
44V Supply Maximum Rating
V_{SS} to V_{DD} Analog Signal Range
Single/Dual Supply Specifications
Wide Supply Ranges (10.8V to 16.5V)
Microprocessor Compatible (100ns $\overline{WR}$ Pulse)
Extended Plastic Temperature Range
(−40°C to +85°C)
Low Leakage (20pA typ)
Low Power Dissipation (28mW max)
Superior Alternative to:
DG528
DG529

ADG528A/ADG529A FUNCTIONAL BLOCK DIAGRAMS



GENERAL DESCRIPTION

The ADG528A and ADG529A are CMOS monolithic analog multiplexers with 8 channels and dual 4 channels respectively. On-chip latches facilitate microprocessor interfacing. The ADG528A switches one of 8 inputs to a common output depending on the state of three binary addresses and an enable input. The ADG529A switches one of 4 differential inputs to a common differential output depending on the state of two binary addresses and an enable input. Both devices have TTL and 5V CMOS logic compatible digital inputs.

The ADG528A and ADG529A are designed on an enhanced LC^2MOS 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 10.8V to 16.5V single or dual supply range. These multiplexers also feature high switching speeds and low R_{ON}.

ORDERING INFORMATION[1]

Temperature Range and Package Options[2]

−40°C to +85°C	−40°C to +85°C	−55°C to +125°C
Plastic DIP (N-18)	**Hermetic (Q-18)**	**Hermetic (Q-18)**
ADG528AKN	ADG528ABQ	ADG528ATQ
ADG529AKN	ADG529ABQ	ADG529ATQ
PLCC[3] (P-20A)		**LCCC[4] (E-20A)**
ADG528AKP		ADG528ATE
ADG529AKP		ADG529ATE

NOTES
[1]To order MIL-STD-883, Class B processed parts, add 883B to part number.
Contact your local sales office for military data sheet.
[2]See Section 14 for package outline information.
[3]PLCC: Plastic Leaded Chip Carrier.
[4]LCCC: Leadless Ceramic Chip Carrier.

PRODUCT HIGHLIGHTS

1. Single/Dual Supply Specifications with a Wide Tolerance:
   The devices are specified in the 10.8V to 16.5V range for both single and dual supplies.
2. Easily Interfaced:
   The ADG528A and ADG529A 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^2MOS 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 20pA make these multiplexers suitable for high precision circuits.

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SPECIFICATIONS

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

Parameter	ADG528A ADG529A K Version +25°C	ADG528A ADG529A K Version −40°C to +85°C	ADG528A ADG529A B Version +25°C	ADG528A ADG529A B Version −40°C to +85°C	ADG528A ADG529A T Version +25°C	ADG528A ADG529A T Version −55°C to +125°C	Units	Comments
ANALOG SWITCH								
Analog Signal Range	V_{SS} V_{DD}	V_{SS} V_{DD}	V_{SS} V_{DD}	V_{SS} V_{DD}	V_{SS} V_{DD}	V_{SS} V_{DD}	V min V max	
R_{ON}	280 450 300	 600 400	280 450 300	 600 400	280 450 300	 600 400	Ω typ Ω max Ω max Ω max	$-10V \le V_S \le +10V$, I_{DS} = 1mA V_{DD} = 15V(±10%), V_{SS} = −15V(±10%) V_{DD} = 15V(±5%), V_{SS} = −15V(±5%)
R_{ON} Drift	0.6		0.6		0.6		%/°C typ	$-10V \le V_S \le +10V$, I_{DS} = 1mA
R_{ON} Match	5		5		5		% typ	$-10V \le V_S \le +10V$, I_{DS} = 1mA
I_S (OFF), Off Input Leakage	0.02 1	 50	0.02 1	 50	0.02 1	 50	nA typ nA max	$V_{S1} = \pm 10V$, $V_D = V_{S2}$ to $V_{SN} = \mp 10V$
I_D (OFF), Off Output Leakage ADG528A ADG529A	0.04 1 1	 100 50	0.04 1 1	 100 50	0.04 1 1	 100 50	nA typ nA max nA max	V_{S1} to $V_{SN} = \pm 10V$, $V_D = \mp 10V$
I_D (ON), On Channel Leakage ADG528A ADG529A	0.04 1 1	 100 50	0.04 1 1	 100 50	0.04 1 1	 100 50	nA typ nA max nA max	V_{S2} to $V_{SN} = \pm 10V$, $V_D = V_{S1} = \mp 10V$
I_{DIFF}, Differential Off Output Leakage (ADG529A only)		25		25		25	nA max	$V_{S1A/B}$ to $V_{S4A/B} = \pm 10V$, $V_{DA} = V_{DB} = \mp 10V$
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[1]								
$t_{TRANSITION}$	200 300	 400	200 300	 400	200 300	 400	ns typ ns max	R_L = 1MΩ, C_L = 35pF
t_{OPEN}	50 25	 10	50 25	 10	50 25	 10	ns typ ns min	R_L = 1kΩ, C_L = 35pF
t_{ON} (EN, $\overline{WR}$)	200 300	 400	200 300	 400	200 300	 400	ns typ ns max	R_L = 1kΩ, C_L = 35pF
t_{OFF} (EN, $\overline{RS}$)	200 300	 400	200 300	 400	200 300	 400	ns typ ns max	R_L = 1kΩ, C_L = 35pF
t_W *Write Pulse Width*	*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 Pulse Width		100		100		100	ns min	See Figure 2
OFF Isolation	68 50		68 50		68 50		dB typ dB min	V_{EN} = 0.8V, R_L = 1kΩ, C_L = 15pF, V_S = 7V rms, f = 100kHz
C_S (OFF)	5		5		5		pF typ	V_{EN} = 0.8V
C_D (OFF) ADG528A ADG529A	22 11		22 11		22 11		pF typ pF typ	V_{EN} = 0.8V
Q_{INJ}, Charge Injection	4		4		4		pC typ	R_S = 0Ω, C_L = 1000pF, V_S = 0V
POWER SUPPLY								
I_{DD}	0.6	 1.5	0.6	 1.5	0.6	 1.5	mA typ mA max	$V_{IN} = V_{INL}$ or V_{INH}
I_{SS}	20	 0.2	20	 0.2	20	 0.2	μA typ mA max	$V_{IN} = V_{INL}$ or V_{INH}
Power Dissipation	10	 28	10	 28	10	 28	mW typ mW max	

NOTE
[1]Sample tested at +25°C to ensure compliance.
Specifications subject to change without notice.

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

Parameter	ADG528A ADG529A K Version +25°C	ADG528A ADG529A K Version −40°C to +85°C	ADG528A ADG529A B Version +25°C	ADG528A ADG529A B Version −40°C to +85°C	ADG528A ADG529A T Version +25°C	ADG528A ADG529A T Version −55°C to +125°C	Units	Comments
ANALOG SWITCH								
Analog Signal Range	GND	GND	GND	GND	GND	GND	V min	
	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V_{DD}	V max	
R_{ON}	500		500		500		Ω typ	GND≤V_S≤ +10V, I_{DS} = 0.5mA
	700	1000	700	1000	700	1000	Ω max	
R_{ON} Drift	0.6		0.6		0.6		%/°C typ	GND≤V_S≤ +10V, I_{DS} = 0.5mA
R_{ON} Match	5		5		5		% typ	GND≤V_S≤ +10V, I_{DS} = 0.5mA
I_S(OFF), Off Input Leakage	0.02		0.02		0.02		nA typ	V_{S1} = +10V/GND, V_D = V_{S2} to V_{SN} = GND/+10V
	1	50	1	50	1	50	nA max	
I_D(OFF), Off Output Leakage	0.04		0.04		0.04		nA typ	V_{S1} to V_{SN} = +10V/GND, V_D = GND/+10V
ADG528A	1	100	1	100	1	100	nA max	
ADG529A	1	50	1	50	1	50	nA max	
I_D(ON), On Channel Leakage	0.04		0.04		0.04		nA typ	V_{S2} to V_{SN} = +10V/GND, V_D = V_{S1} = GND/+10V
ADG528A	1	100	1	100	1	100	nA max	
ADG529A	1	50	1	50	1	50	nA max	
I_{DIFF}, Differential Off Output Leakage (ADG529A only)		25		25		25	nA max	$V_{S1A,B}$ to $V_{S4A/B}$ = +10V/GND, V_{DA} = V_{DB} = GND/+10V
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[1]								
$t_{TRANSITION}$	300		300		300		ns typ	R_L = 1mΩ, C_L = 35pF
	450	600	450	600	450	600	ns max	
t_{OPEN}	50		50		50		ns typ	R_L = 1kΩ, C_L = 35pF
	25	10	25	10	25	10	ns min	
t_{ON}(EN, $\overline{WR}$)	250		250		250		ns typ	R_L = 1kΩ, C_L = 35pF
	450	600	450	600	450	600	ns max	
t_{OFF}(EN, $\overline{RS}$)	250		250		250		ns typ	R_L = 1kΩ, C_L = 35pF
	450	600	450	600	450	600	ns max	
t_W Write Pulse Width	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 Pulse Width		100		100		100	ns min	See Figure 2
OFF Isolation	68		68		68		dB typ	V_{EN} = 0.8V, R_L = 1kΩ, C_L = 15pF,
	50		50		50		dB min	V_S = 3.5V rms, f = 100kHz
C_S(OFF)	5		5		5		pF typ	V_{EN} = 0.8V
C_D(OFF)								
ADG528A	22		22		22		pF typ	V_{EN} = 0.8V
ADG529A	11		11		11		pF typ	
Q_{INJ}, Charge Injection	4		4		4		pC typ	R_S = 0Ω, C_L = 1000pF, V_S = 0V
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	

NOTE
[1]Sample tested at +25°C to ensure compliance.
Specifications subject to change without notice.

TRUTH TABLES

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

ADG528A

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

X = Don't Care

ADG529A

ABSOLUTE MAXIMUM RATINGS*

(T_A = +25°C unless otherwise noted)

V_{DD} to V_{SS}	44V
V_{DD} to GND	25V
V_{SS} to GND	−25V
Analog Inputs[1]	
Voltage at S, D	V_{SS} −2V to V_{DD} +2V or 20mA, Whichever Occurs First
Continuous Current, S or D	20mA
Pulsed Current S or D	
1ms Duration, 10% Duty Cycle	40mA
Digital Inputs[1]	
Voltage at A, EN, $\overline{WR}$, $\overline{RS}$	V_{SS} −4V to V_{DD} +4V or 20mA, Whichever Occurs First
Power Dissipation (Any Package)	
Up to +75°C	470mW
Derates above +75°C by	6mW/°C
Operating Temperature	
Commerical (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, 10sec)	+300°C

NOTE

[1]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.

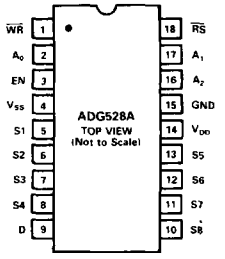
*COMMENT: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

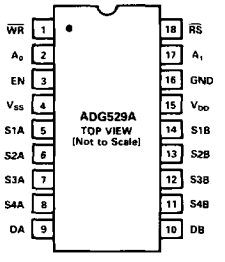
CAUTION

ESD (electrostatic discharge) sensitive device. The digital control inputs are diode protected; however, permanent damage may occur on unconnected devices subject to high energy electrostatic fields. Unused devices must be stored in conductive foam or shunts. The protective foam should be discharged to the destination socket before devices are removed.

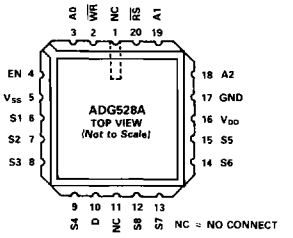
PIN CONFIGURATIONS

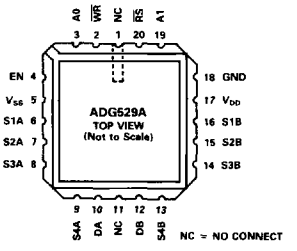
DIP



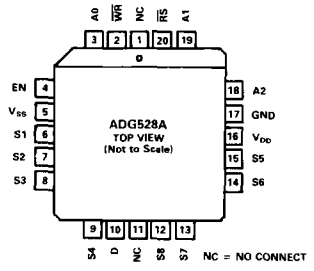


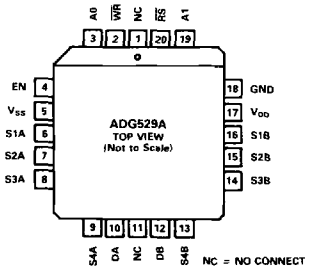
LCCC





PLCC





TIMING DIAGRAMS

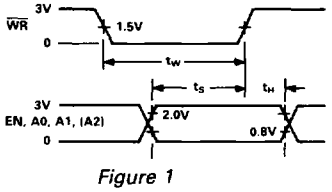


Figure 1

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 $\overline{WR}$.

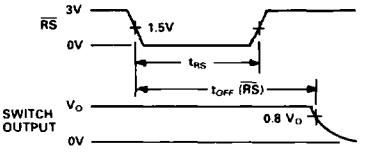


Figure 2

Figure 2 shows the Reset Pulse Width, 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 3V. $t_R = t_F = 20ns$.