

Monolithic 4-Channel PMOS Analog Switch

FEATURES

- TTL, CMOS Direct Interface
- Voltage Limiting Diodes Protect PMOS Gates
- Four Independent Switches
- Chip Select Pin (V_L)
- Make-Before-Break Switching

BENEFITS

- Easy Interface
- Reduces External Protection Components
- Easily Expandable
- Will Not Leave Op Amp Input Floating

APPLICATIONS

- Programmable Gain Amplifiers
- Sample/Hold
- Solid-State Logic Trees

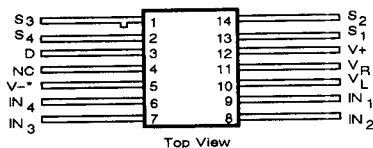
DESCRIPTION

The DG172 is a 4-channel single-pole, single-throw analog switch designed for low level logic controlled analog switching in instrumentation, process control, and communications. Featuring Make-Before-Break action, DG172 can be used inside closed loop systems to select one of four inputs for multiplexing/demultiplexing of analog signals or for gain bandwidth control (by switching passive elements) without opening the loop. The reference pin (V_R) is normally connected to ground to allow TTL level inputs (0.8 V to 2.0 V) to control the

ON-OFF condition of each switch. The DG172 is a bi-directional MOS switch rated to handle 20 V peak-to-peak analog signals at up to 30 mA continuous current. Each switch will block 20 V peak-to-peak signals when OFF. Package options are the 14-pin ceramic and plastic DIP and flatpack. The former is characterized for operation over the standard industrial, B suffix (-25 to 85°C) and military, A suffix (-55 to 125°C) temperature ranges, while the latter is specified for the military range only.

PIN CONFIGURATION

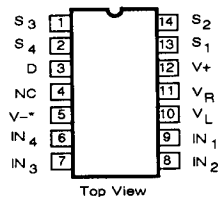
Flat Package



Order Number:
DG172AL/883

* Common to Substrate and Base of Package

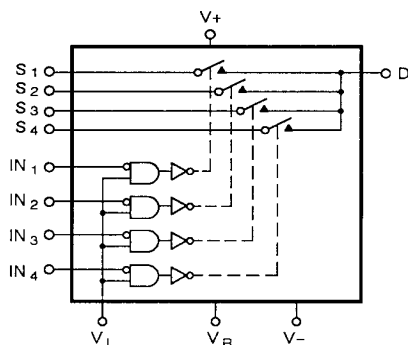
Dual-In-Line Package



Order Numbers:

Side Braze: DG172AP, DG172BP
Plastic: DG172CJ

FUNCTIONAL BLOCK DIAGRAM AND TRUTH TABLE



Truth Table	
LOGIC	SWITCH
0	ON
1	OFF

Logic "0" ≤ 0.8 V
Logic "1" ≥ 2.0 V

*Switches Shown for Logic "1" Input

One 4-Channel Switch per Package*

ABSOLUTE MAXIMUM RATINGS

V_+ to V_-	36 V	Storage Temperature (A & B Suffix)	-65 to 150°C
V_+ to V_D	25 V	(C Suffix)	-65 to 125°C
V_+ to V_S	25 V	Operating Temperature (A Suffix)	-55 to 125°C
V_S to V_-	36 V	(B Suffix)	-25 to 85°C
V_D to V_-	36 V	(C Suffix)	0 to 70°C
V_S to V_D	25 V	Power Dissipation (Package) *	
V_L to V_-	30 V	Flat Package**	750 mW
V_L to V_{IN}	± 6 V	14-Pin Ceramic DIP***	825 mW
V_L to V_R	± 6 V	14-Pin Plastic DIP****	470 mW
V_{IN} to V_R	± 6 V		
Current (Any Terminal)	20 mA	* All leads welded or soldered to PC board.	
		** Derate 10 mW/°C above 75°C.	
		*** Derate 11 mW/°C above 75°C.	
		**** Derate 6.3 mW/°C above 75°C.	

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ELECTRICAL CHARACTERISTICS ^a

PARAMETER	SYMBOL	Test Conditions Unless Otherwise Specified: V ₊ = 10 V V ₋ = -20 V V _R = 0 V V _L = 5 V		LIMITS								UNIT
				1=25°C		A SUFFIX -55 to 125°C		B SUFFIX -25 to 85°C		C SUFFIX 0 to 70°C		
				TEMP	TYP ^d	MIN ^b	MAX ^b	MIN ^b	MAX ^b	MIN ^b	MAX ^b	
SWITCH												
Analog Signal Range ^c	V _{ANALOG}			1,2,3		-10	10	-10	10	-10	10	V
Drain-Source ON Resistance	r _{DS(ON)}	I _S = -1 mA V _{IN} = 0.8 V	V _D = 10 V	1,3 2	100		150 250		150 250		200	Ω
			V _D = 0 V	1,3 2	130		200 350		225 300		300	
			V _D = -10 V	1,3 2	300		450 600		500 600		600	

Not Recommended for New Designs

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ELECTRICAL CHARACTERISTICS ^a											
PARAMETER	SYMBOL	Test Conditions Unless Otherwise Specified: V ₊ = 10 V V ₋ = -20 V V _R = 0 V V _L = 5 V	LIMITS								UNIT
			1=25°C 2=125,85°C 3=-55,-25°C		A SUFFIX -55 to 125°C		B SUFFIX -25 to 85°C		C SUFFIX 0 to 70°C		
			TEMP	TYP ^d	MIN ^b	MAX ^b	MIN ^b	MAX ^b	MIN ^b	MAX ^b	
SWITCH (Cont'd)											
Source OFF Leakage Current	I _{S(OFF)}	V _S = -10 V, V _D = 10 V V _{IN} = 2 V	1 2	-0.03	-1 -1000		-5 -100		-10		nA
Drain OFF Leakage Current	I _{D(OFF)}	V _D = -10 V, V _S = 10 V V _{IN} = 2 V	1 2	-0.12	-4 -4000		-10 -300		-10		
Channel ON Leakage Current	I _{D(ON)} + I _{S(ON)}	V _D =V _S = 10 V V _{IN} = 0.8 V	1 2			4 4000		10 300		10	
INPUT											
Input Current with Input Voltage HIGH	I _{INH}	V _{IN} = 5 V	1,3 2			0.1 10		1 10		1	μA
Input Current with Input Voltage LOW	I _{INL}	V _{IN} = 0 V	1,3 2		-0.5 -0.5		-1 -1		-1		mA
DYNAMIC											
Turn-ON Time	t _{ON}	See Switching Time Test Circuit	1			0.3		0.5			μs
Turn-OFF Time	t _{OFF}		1			0.75		1.0			
Source OFF ^c Capacitance	C _{S(OFF)}	V _S = 0 V, I _L = 0 f = 1 MHz	1	5							pF
Drain OFF ^c Capacitance	C _{D(OFF)}	V _D = 0 V, I _S = 0 f = 1 MHz	1	18							
Channel ON ^c Capacitance	C _{D(ON)} + C _{S(ON)}	V _D =V _S = 0 V, V _{ITJ} = 0 V f = 140 kHz	1	28							
Off Isolation ^c		R _L = 100 Ω, C _L = 3 pF f = 5 MHz	1	>50							dB
SUPPLY											
Positive Supply Current	I ₊	One Channel ON V _{IN} = 0 V	1	1.3		3		3		3	mA
Negative Supply Current	I ₋		1	-2.0	-5.1		-5.1		-5.1		
Logic Supply Current	I _L		1	2.5		5.7		5.7		5.7	
		One Channel ON V _{IN} = 0 V I _R = 0	1	0.8		2.1		2.1		2.1	
Reference Supply Current	I _R	One Channel ON V _{IN} = 0 V	1	-1.5	-3.6		-3.6		-3.6		

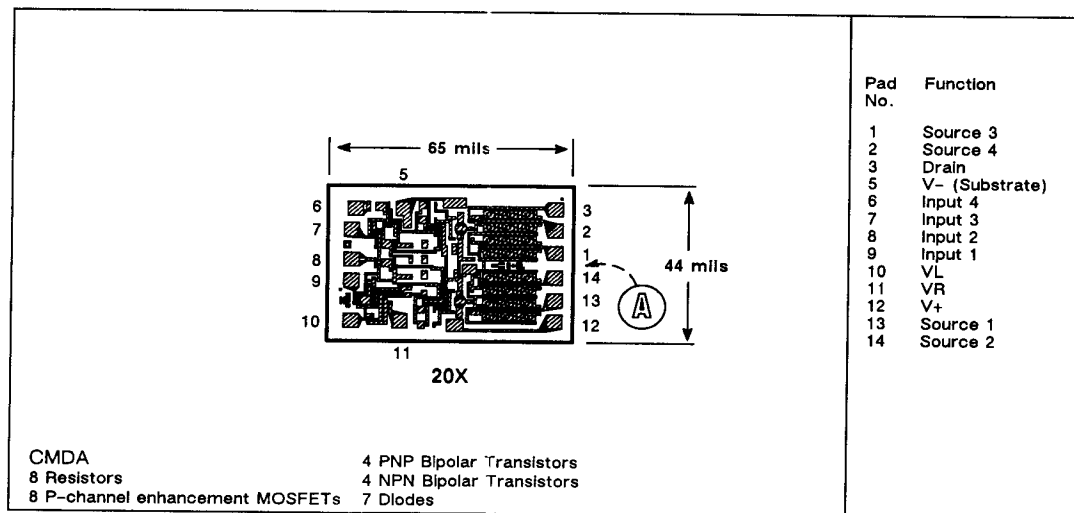
ELECTRICAL CHARACTERISTICS ^a											
PARAMETER	SYMBOL	Test Conditions Unless Otherwise Specified: V ₊ = 10 V V ₋ = -20 V V _R = 0 V V _L = 5 V	LIMITS								UNIT
			1=25°C 2=125,85°C 3=-55,-25°C		A SUFFIX -55 to 125°C		B SUFFIX -25 to 85°C		C SUFFIX 0 to 70°C		
			TEMP	TYP ^d	MIN ^b	MAX ^b	MIN ^b	MAX ^b	MIN ^b	MAX ^b	
SUPPLY											
Positive Supply Current	I ₊	All Channels OFF V _{IN} = 5 V	1	0.1		10		10		10	μA
Negative Supply Current	I ₋		1	-0.01	-20		-20		-20		
Logic Supply Current	I _L	All Channels OFF V _{IN} = 5 V I _R = 0	1	2.0		4.5		4.5		4.5	mA
			1	0.1		10		10		10	μA
Reference Supply Current	I _R	All Channels OFF V _{IN} = 5 V	1	2.0	-4.5		-4.5		-4.5		mA

NOTES:

- Refer to PROCESS OPTION FLOWCHART for additional information.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Guaranteed by design, not subject to production test.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

DIE TOPOGRAPHY

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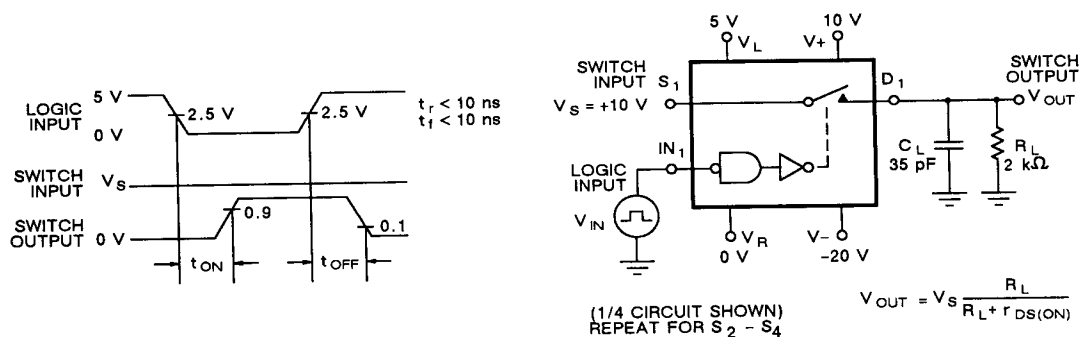


Not Recommended for New Designs

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SWITCHING TIME TEST CIRCUIT

Switch output waveform shown for $V_S = \text{constant}$ with logic input waveform as shown. Note that V_S may be + or - as per switching time test circuit. V_O is the steady state output with switch ON. Feedthrough via gate capacitance may result in spikes at leading and trailing edge of output waveform.



APPLICATION HINTS*

V+ Positive Supply Voltage (V)	V- Negative Supply Voltage (V)	VR Reference Pin Connection	VL Logic Supply Voltage (V)	VIN Logic Input Voltage VINH Min/ VINL Max (V)	VS Analog Signal Range (V)
10**	-20	GND	5	2.0/0.8	-10 to 10
10**	-20	OPEN	5	4.6/0.5	-10 to 10
15	-15	GND	5	2.0/0.8	-5 to 15
20	-10	GND	5	2.0/0.8	0 to 20
5	-15	GND	5	2.0/0.8	-5 to 5
5	-25	GND	5	2.0/0.8	-15 to 5

* Application Hints are for DESIGN AID ONLY, not guaranteed and not subject to production testing.

** Electrical Characteristics are based on $V_+ = +10\text{ V}$, $V_- = -20\text{ V}$ only.