Monolithic Dual SPST CMOS Analog Switch

Features

- ± 15 V Input Signal Range
- 44-V Maximum Supply Ranges
- On-Resistance: 45 Ω
- TTL and CMOS Compatibility

Benefits

- Wide Dynamic Range
- Simple Interfacing
- Reduced External Component Count

Applications

- Servo Control Switching
- Programmable Gain Amplifiers
- Audio Switching
- Programmable Filters

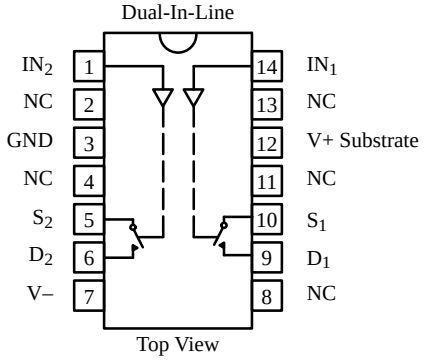
Description

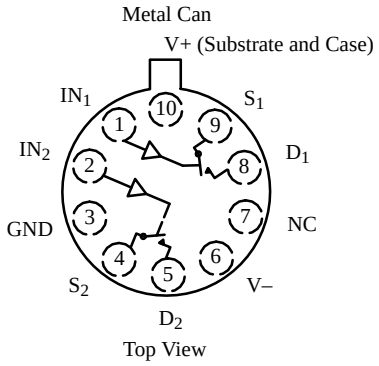
The DG200A is a dual, single-pole, single-throw analog switch designed to provide general purpose switching of analog signals. This device is ideally suited for designs requiring a wide analog voltage range coupled with low on-resistance.

The DG200A is designed on Siliconix' improved PLUS-40 CMOS process. An epitaxial layer prevents latchup.

Each switch conducts equally well in both directions when on, and blocks up to 30 V peak-to-peak when off. In the on condition, this bi-directional switch introduces no offset voltage of its own.

Functional Block Diagram and Pin Configuration





Ordering Information

Temp Range	Package	Part Number
0 to 70°C	14-Pin Plastic DIP	DG200ACJ
–25 to 85°C	14-Pin CerDIP	DG200ABK
	10-Pin Metal Can	DG200ABA
–55 to 125°C	14-Pin CerDIP	DG200AAK
		DG200AAK/883, JM38510/12301BCA
	10-Pin Metal Can	DG200AAA
		DG200AAA/883, JM38510/12301BIC
	14-Pin Sidebraze	JM38510/12301BCC

Truth Table

Logic	Switch
0	ON
1	OFF

Logic "0" ≤ 0.8 V
Logic "1" ≥ 2.4 V

Switches Shown for Logic "0" Input

Updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document #70035.

Absolute Maximum Ratings

V+ to V– . . . . . 44 V

GND to V– . . . . . 25 V

Digital Inputs[a], V_S, V_D . . . . . (V–) –2 V to (V+) +2 V or 30 mA, whichever occurs first

Current (Any Terminal) Continuous . . . . . 30 mA

Current S or D
(Pulsed at 1 ms, 10% Duty Cycle Max) . . . . . 100 mA

Storage Temperature (AX, BX Suffix) . . . . . –65 to 150°C
(CJ Suffix) . . . . . –65 to 125°C

Power Dissipation (Package)[b]
10-Pin Metal Can[c] . . . . . 450 mW
14-Pin CerDIP[d] . . . . . 825 mW
14-Pin Plastic DIP[e] . . . . . 470 mW

Notes:
a. Signals on S_X, D_X, or IN_X exceeding V+ or V– will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
b. All leads welded or soldered to PC Board.
c. Derate 6 mW/°C above 75°C
d. Derate 11 mW/°C above 75°C
e. Derate 6.5 mW/°C above 25°C

Specifications[a]

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 15 V, V– = –15 V, V_{IN} = 2.4 V, 0.8 V[f]		Temp[b]	Typ[c]	A Suffix –55 to 125°C Min[d]	A Suffix –55 to 125°C Max[d]	B, C Suffix Min[d]	B, C Suffix Max[d]	Unit
Analog Switch										
Analog Signal Range[e]	V_{ANALOG}			Full		–15	15	–15	15	V
Drain-Source On-Resistance	$r_{DS(on)}$	V_D = ±10 V, I_S = –1 mA		Room Full	45		70 100		80 100	Ω
Source Off Leakage Current	$I_{S(off)}$	V_S = ±14 V, V_D = ∓14 V		Room Full	±0.01	–2 –100	2 100	–5 –100	5 100	nA
Drain Off Leakage Current	$I_{D(off)}$	V_D = ±14 V, V_S = ∓14 V		Room Full	±0.01	–2 –100	2 100	–5 –100	5 100	
Channel On Leakage Current[f]	$I_{D(on)}$	V_S = V_D = ±14 V		Room Full	±0.1	–2 –200	2 200	–5 –200	5 200	
Digital Control										
Input Current with Input Voltage High	I_{INH}	V_{IN} = 2.4 V		Room Full	0.0009	–0.5 –1		–1 –10		µA
		V_{IN} = 15 V		Room Full	0.005		0.5 1		1 10	
Input Current with Input Voltage Low	I_{INL}	V_{IN} = 0 V		Room Full	–0.0015	–0.5 –1		–1 –10		
Dynamic Characteristics										
Turn-On Time	t_{ON}	See Switching Time Test Circuit		Room	440		1000		1000	ns
Turn-Off Time	t_{OFF}			Room	340		425		425	
Charge Injection	Q	C_L = 1000 pF, V_g = 0 V, R_g = 0 Ω		Room	–10					pC
Source-Off Capacitance	$C_{S(off)}$	f = 140 kHz, V_{IN} = 5 V	V_S = 0 V	Room	9					pF
Drain-Off Capacitance	$C_{D(off)}$		V_D = 0 V	Room	9					
Channel-On Capacitance	$C_{D(on)}$ + $C_{S(On)}$	V_D = V_S = 0 V, V_{IN} = 0 V		Room	25					
Off Isolation	OIRR	V_{IN} = 5 V, R_L = 75 Ω, V_S = 2 V, f = 1 MHz		Room	75					dB
Crosstalk (Channel-to-Channel)	X_{TALK}			Room	90					

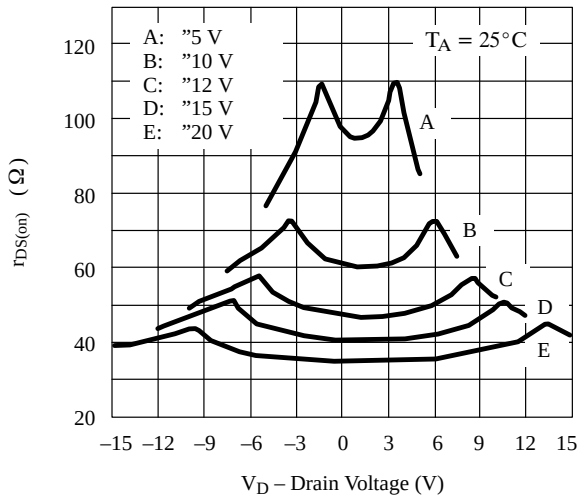
Specifications[a]

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 15 V, V– = –15 V V_{IN} = 2.4 V, 0.8 V[f]	Temp[b]	Typ[c]	A Suffix –55 to 125°C Min[d]	A Suffix –55 to 125°C Max[d]	B, C Suffix Min[d]	B, C Suffix Max[d]	Unit
Power Supplies									
Positive Supply Current	I+	Both Channels On or Off V_{IN} = 0 V and 2.4 V	Room	0.8		2		2	mA
Negative Supply Current	I–		Room	–0.23	–1		–1		mA

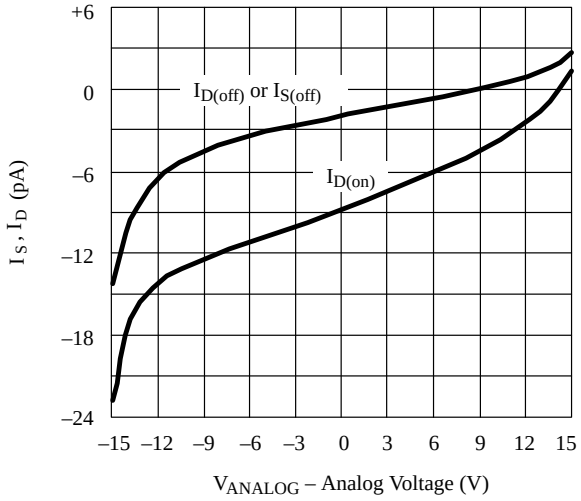
Notes:
a. Refer to PROCESS OPTION FLOWCHART (Section 5 of the 1994 Data Book or FaxBack number 7103).
b. Room = 25°C, Full = as determined by the operating temperature suffix.
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
d. The algebraic convention whereby the most negative value is aminimum and the most positive a maximum, is used in this data sheet.
e. Guaranteed by design, not subject to production test.
f. V_{IN} = input voltage to perform proper function.

Typical Characteristics

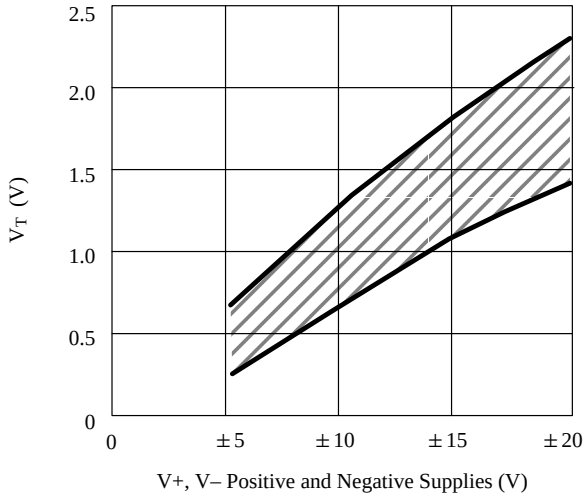
$r_{DS(on)}$ vs. V_D and Power Supply Voltage



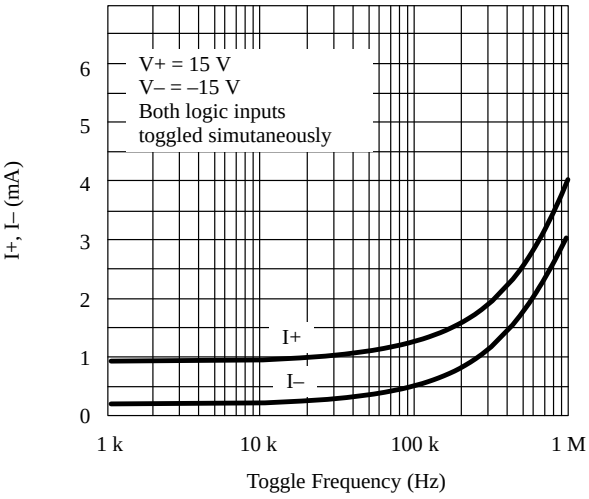
Leakage Currents vs. Analog Voltage



Input Switching Threshold vs. V+ and V– Supply Voltages



Supply Currents vs. Toggle Frequency



Schematic Diagram (Typical Channel)

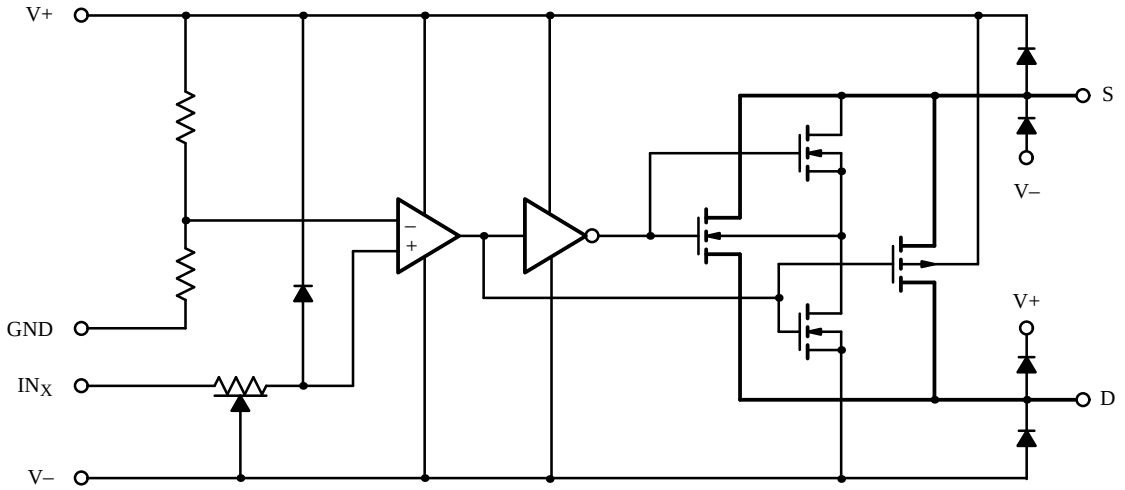


Figure 1.

Test Circuits

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 wavefo

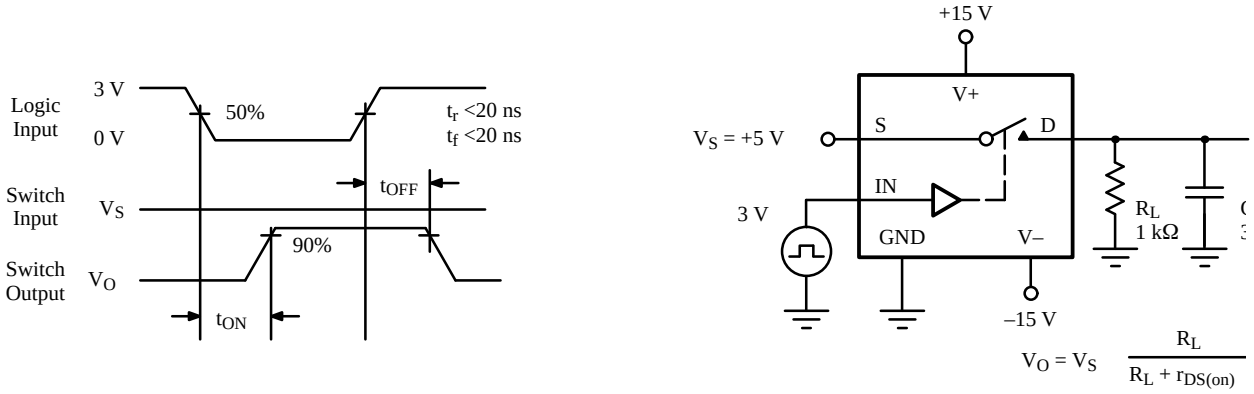


Figure 2. Switching Time

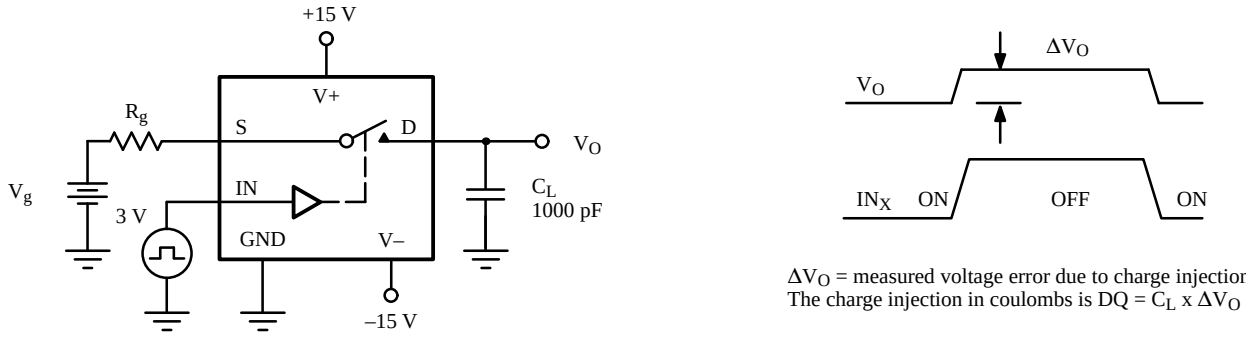


Figure 3. Charge Injection

Test Circuits (Cont'd)

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.

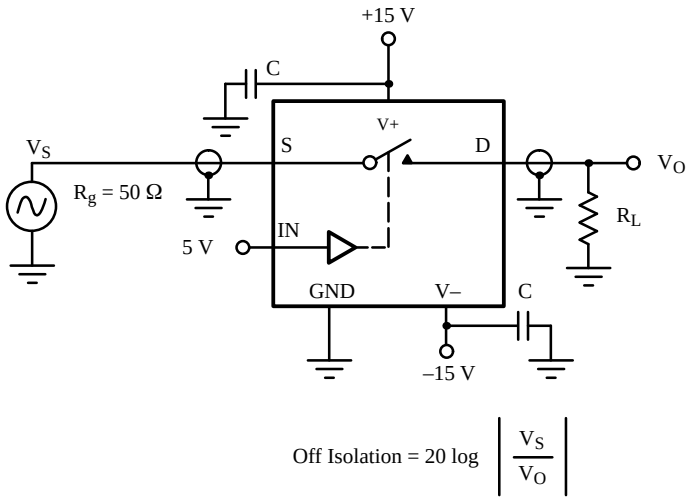


Figure 4. Off Isolation

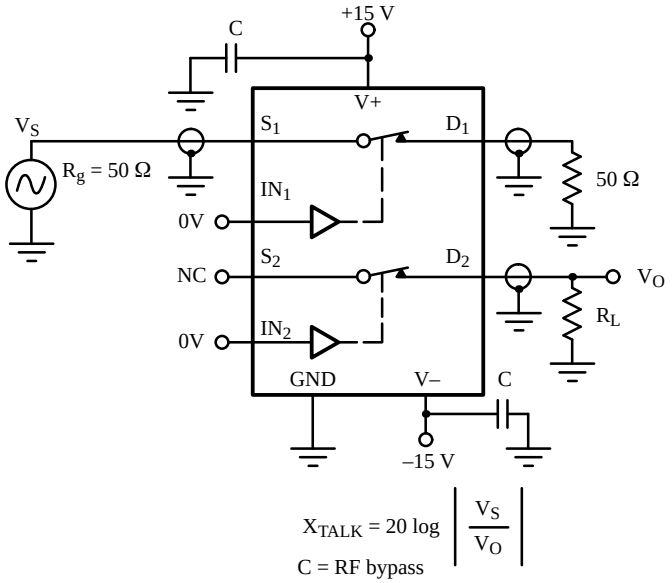


Figure 5. Channel-to-Channel Crosstalk