Monolithic Dual SPST CMOS Analog Switch

DESCRIPTION

The DG200B 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 DG200B is designed on Vishay 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.

FEATURES

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

Pb-free Available

RoHS* COMPLIANT

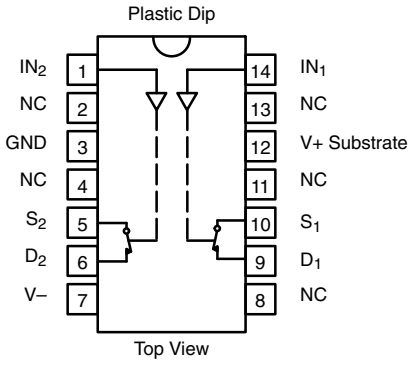
BENEFITS

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

APPLICATIONS

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

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



TRUTH TABLE	
Logic	**Switch**
0	ON
1	OFF

Logic "0" ≤ 0.8 V
Logic "1" ≥ 2.4 V

ORDERING INFORMATION		
Temp Range	**Package**	**Part Number**
- 40 to 85 °C	14-Pin Plastic DIP	DG200BDJ DG200BDJ-E3

* Pb containing terminations are not RoHS compliant, exemptions may apply

ABSOLUTE MAXIMUM RATINGS T_A = 25°C, unless otherwise noted			
Parameter		**Limit**	**Unit**
V+ to V-		44	V
GND to V-		25	
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	
Storage Temperature		- 65 to 150	°C
Power Dissipation (Package)[b]	14-Pin Plastic DIP[c]	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 6.5 mW/°C above 25 °C.

SCHEMATIC DIAGRAM (TYPICAL CHANNEL)

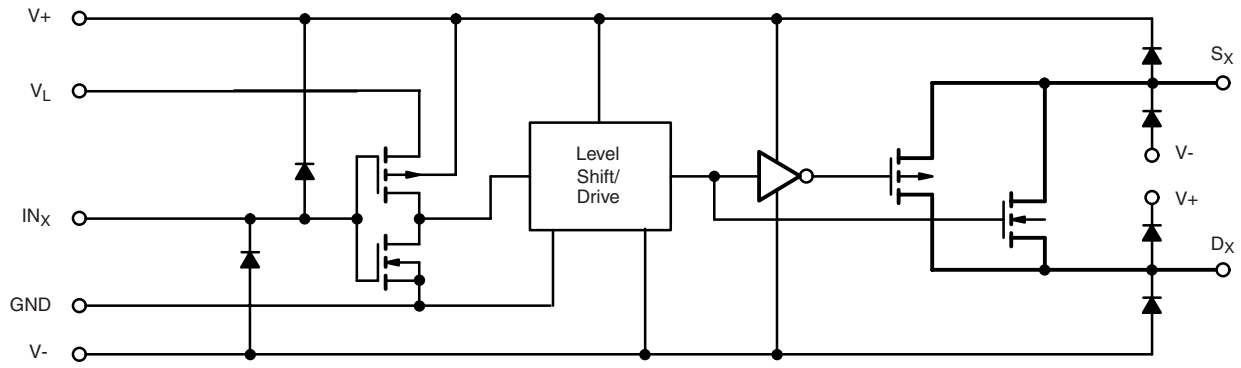


Figure 1.

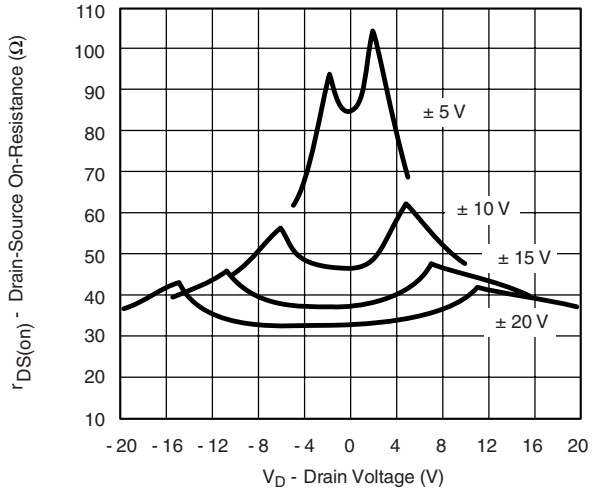
SPECIFICATIONS[a]

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 15 V, V- = - 15 V V_{IN} = 2.4 V, 0.8 V[f]	Temp[b]	Limits - 40 to 85 °C Min[c]	Typ[d]	Max[c]	Unit
Analog Switch							
Analog Signal Range[e]	V_{ANALOG}		Full	- 15		15	V
Drain-Source On-Resistance	$r_{DS(on)}$	V_D = ± 10 V, I_S = - 1 mA	Room Full		45	85 100	Ω
Source Off Leakage Current	$I_{S(off)}$	V_S = ± 14 V, V_D = ∓ 14 V	Room Full	- 2 - 100	± 0.01	2 100	nA
Drain Off Leakage Current	$I_{D(off)}$	V_D = ± 14 V, V_S = ∓ 14 V	Room Full	- 2 - 100	± 0.01	2 100	
Channel On Leakage Current[f]	$I_{D(on)}$	V_S = V_D = ± 14 V	Room Full	- 2 - 200	± 0.1	2 200	
Digital Control							
Input Current with Input Voltage High	I_{INH}	V_{IN} = 2.4 V	Room Full	- 0.5 - 1	0.0009		µA
		V_{IN} = 15 V	Room Full		0.005	0.5 1	
Input Current with Input Voltage Low	I_{INL}	V_{IN} = 0 V	Room Full	- 0.5 - 1	- 0.0015		
Dynamic Characteristics							
Turn-On Time	t_{ON}	See Switching Time Test Circuit	Room		300	1000	ns
Turn-Off Time	t_{OFF}		Room		200	425	
Charge Injection	Q	C_L = 1000 pF, R_g = 0 Ω, V_g = 0 V	Room		1		pC
Source Off Capacitance	$C_{S(off)}$	f = 140 kHz, V_{IN} = 5 V, V_S = 0 V	Room		5		pF
Drain Off Capacitance	$C_{D(off)}$	f = 140 kHz, V_{IN} = 5 V, V_D = 0 V	Room		5		
Channel-On Capacitance	$C_{D(on)}$+ $C_{S(on)}$	V_S = V_D = 0 V, V_{IN} = 0 V	Room		16		
Off Isolation	OIRR	V_{IN} = 5 V, R_L = 75 Ω, V_S = 2 V, f = 1 MHz	Room		90		dB
Crosstalk (Channel-to-Channel)	X_{TALK}		Room		95		
Power Supplies							
Positive Supply Current	I+	Both Channels On or Off, V_{IN} = 0 V and 5.0 V	Room			50	µA
Negative Supply Current	I-		Room	- 10			

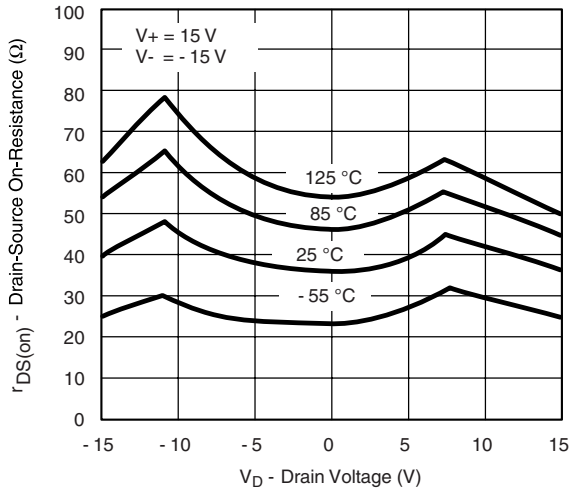
Notes:
a. Refer to PROCESS OPTION FLOWCHART.
b. Room = 25 °C, Full = as determined by the operating temperature suffix.
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
d. The algebraic convention whereby the most negative value is a minimum and the most positive 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.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

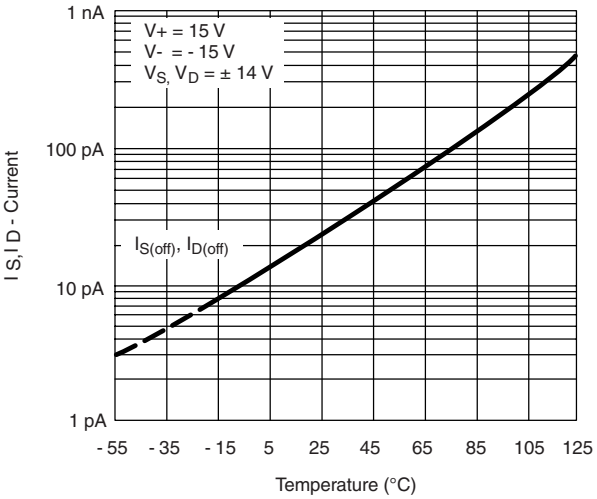
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



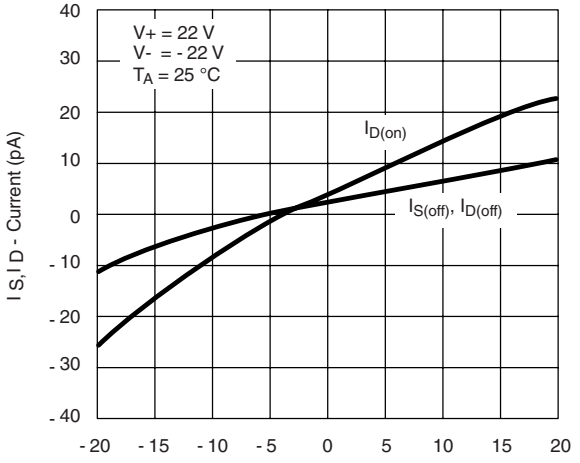
$r_{DS(on)}$ vs. V_D and Power Supply Voltages



$r_{DS(on)}$ vs. V_D and Temperature



Leakage Current vs. Temperature



Leakage Currents vs. Analog Voltage

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 waveform.

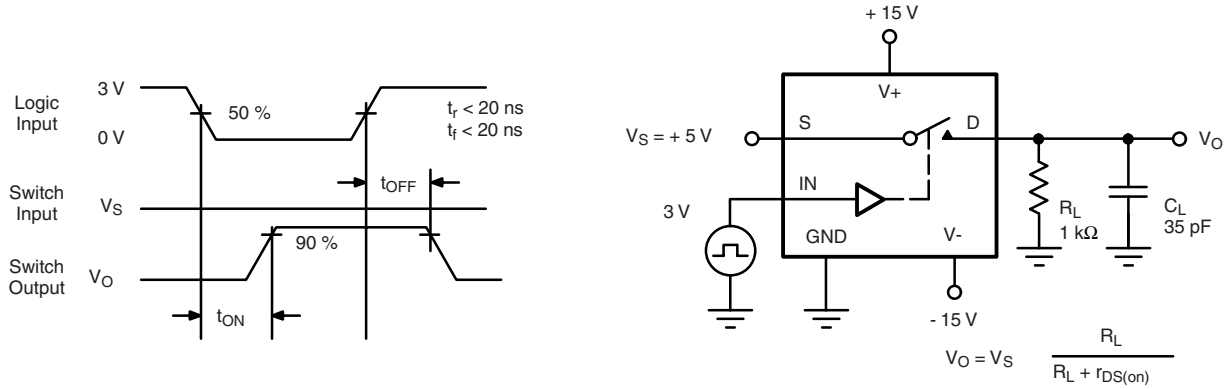


Figure 2. Switching Time

TEST CIRCUITS

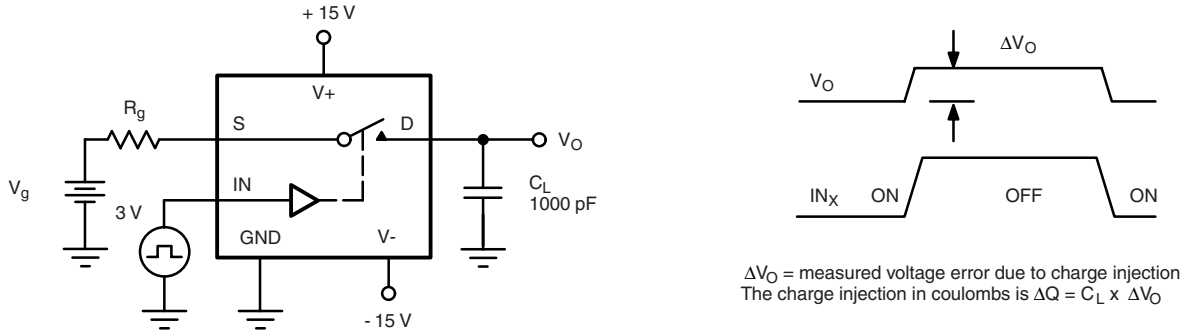


Figure 3. Charge Injection

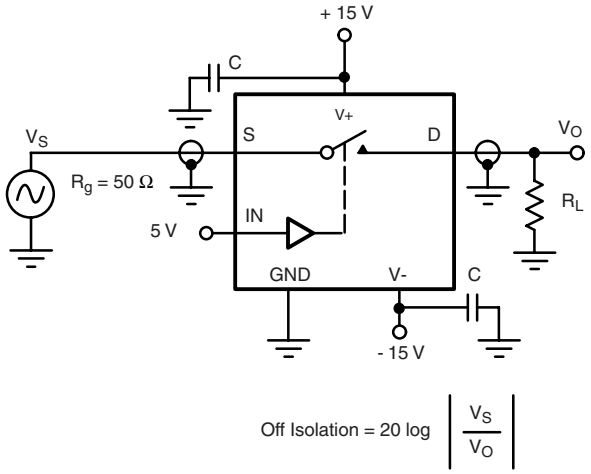


Figure 4. Off Isolation

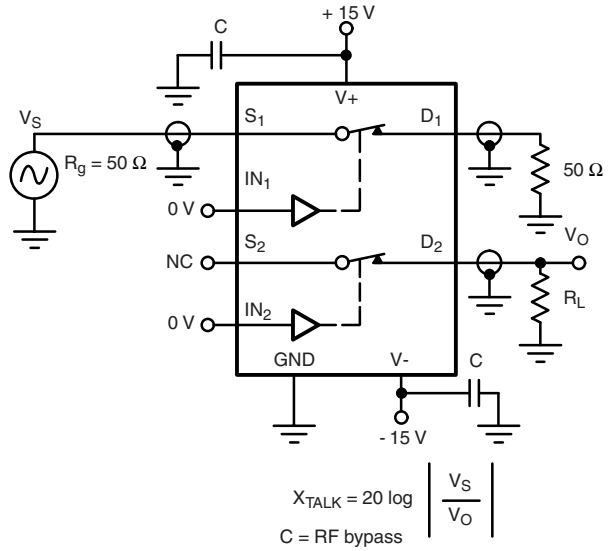


Figure 5. Channel-to-Channel Crosstalk

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