19-0484; Rev 1; 5/96

Dual Monolithic SPST CMOS Analog Switch

General Description

The DG200A is a dual, normally closed, single-pole-single-throw (SPST) analog switch. This CMOS switch can be operated with power supplies ranging from ±4.5V to ±18V. The DG200A has guaranteed break-before-make switching. Its maximum turn-off time is 500ns, and its maximum turn-on time is 100ns.

Maxim guarantees that the DG200A will not latch-up if the power supplies are turned off with input signals still connected as long as absolute maximum ratings are not violated.

Compared to the original manufacturer's product, Maxim's DG200A consumes significantly lower power, making it better suited for portable applications.

Applications

Winchester Disk Drives

Test Equipment

Communications Systems

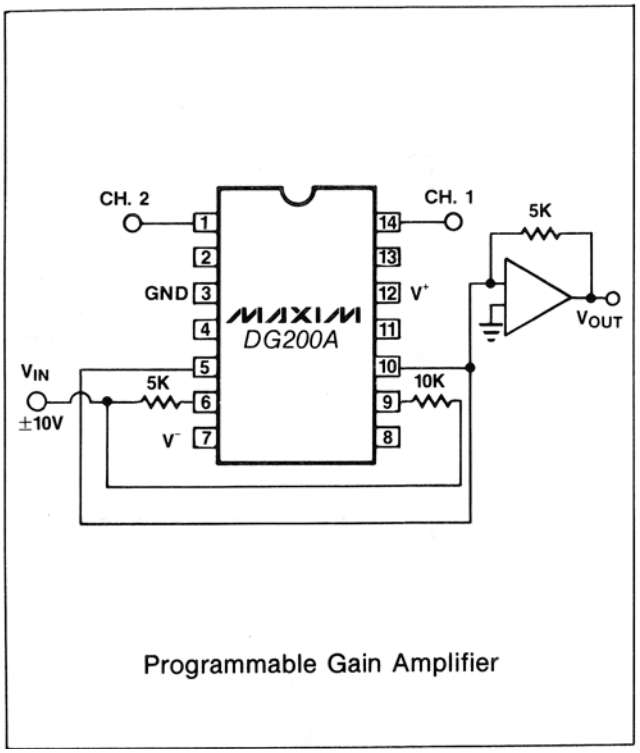
PBX, PABX

Guidance and Control Systems

Head up Displays

Military Radios

Typical Operating Circuit



Programmable Gain Amplifier

Features

- **Improved 2nd Source! Power Supply Current <300μA**
- **Wide Supply Range ±4.5V to ±18V**
- **Single Supply Operation**
- **Non-Latching with Supplies Turned-off and Input Signals Present**
- **CMOS and TTL Logic Compatible**
- **Monolithic, Low Power CMOS Design**

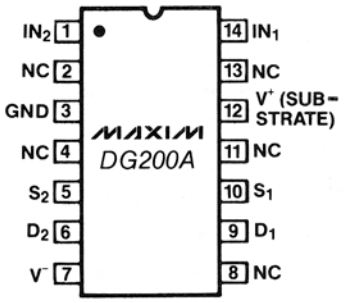
Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
DG200AAK	-55°C to +125°C	14 Lead CERDIP
DG200ABK	-25°C to +85°C	14 Lead CERDIP*
DG200ACK	0°C to +70°C	14 Lead CERDIP
DG200ACJ	0°C to +70°C	14 Lead Plastic DIP
DG200ADJ	-40°C to +85°C	14 Lead Plastic DIP
DG200ACY	0°C to +70°C	14 Lead SO
DG200ADY	-40°C to +85°C	14 Lead SO
DG200AC/D	0°C to +70°C	Dice
DG200AAA	-55°C to +125°C	10 Pin Metal Can*
DG200ABA	-25°C to +85°C	10 Pin Metal Can*
DG200ACA	0°C to +70°C	10 Pin Metal Can*

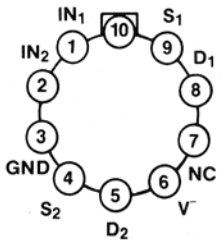
*Contact factory for availability.

Pin Configuration

Top View



V+ (SUBSTRATE AND CASE)



Dual Monolithic SPST CMOS Analog Switch

ABSOLUTE MAXIMUM RATINGS

Voltages Referenced to V⁻
V⁺ 44V
GND 25V
Digital Inputs V_S, V_D (Note 1) ..... -2V to (V^+ + 2V)
or 20mA, whichever occurs first.
Current, Any Terminal Except S or D 30mA
Continuous Current, S or D 20mA
(Pulsed at 1msec, 10% duty cycle max) 100mA
Storage Temperature (A & B Suffix) ..... -65 to 150°C
(C Suffix) ..... -65 to 125°C

Operating Temperature (A Suffix) ..... -55 to 125°C
(B Suffix) ..... -25 to 85°C
(C Suffix) ..... -25 to 85°C
(D Suffix) ..... -40 to 85°C
Power Dissipation (Package)*
Metal Can** 450mW
14 Pin Ceramic DIP*** 825mW
14 Pin Plastic DIP**** 470mW
* All leads soldered or welded to PC board.
** Derate 6mW/°C above 75°C.
*** Derate 11mW/°C above 75°C.
**** Derate 6.5mW/°C above 25°C.

Stresses listed under "Absolute Maximum Ratings" may be applied (one at a time) to devices without resulting in permanent damage. These are stress ratings only, and functional operation of the device at these or any other conditions above 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.

ELECTRICAL CHARACTERISTICS (V^+ = +15V, V^- = -15V, GND = 0V, T_A = 25°C, unless otherwise indicated.)

PARAMETER	SYMBOL	TEST CONDITIONS		LIMITS DG200A MIN (Note 2)	DG200A TYP (Note 3)	DG200A MAX	LIMITS DG200 B/C/D MIN (Note 2)	DG200 B/C/D TYP (Note 3)	DG200 B/C/D MAX	UNITS
SWITCH										
Analog Signal Range (Note 1)	V_{ANALOG}			-15		15	-15		15	V
Drain-Source ON Resistance	$r_{DS(on)}$	V_D = ±10V, V_{in} = 0.8V, I_S = 1mA			45	70		45	80	Ω
Source OFF Leakage Current	$I_{S(off)}$	V_{in} = 2.4V	V_S = 14V, V_D = -14V		0.01	2.0		0.01	5.0	nA
			V_S = -14V, V_D = 14V	-2.0	-0.02		-5.0	-0.02		
Drain OFF Leakage Current	$I_{D(off)}$		V_S = -14V, V_D = 14V		0.01	2.0		0.01	5.0	
			V_S = 14V, V_D = -14V	-2.0	-0.02		-5.0	-0.02		
Drain ON Leakage Current (Note 4)	$I_{D(on)}$	V_{in} = 0.8V	V_S = V_D = 14V		0.1	2.0		0.1	5.0	
			V_S = V_D = -14V	-2.0	-0.1		-5.0	-0.1		
INPUT										
Input Current with Input Voltage High	I_{NH}	V_{in} = 2.4V, V_{in} = 15V		-1.0	0.0009		-1.0	0.0009		μA
					0.005	1.0		0.005	1.0	
Input Current with Input Voltage Low	I_{INL}	V_{in} = 0V		-1.0	-0.0015		-1.0	-0.0015		
DYNAMIC										
Turn-ON Time	t_{on}	See Switching Time Test Circuit (Figure 1)			440	1000		440	1000	ns
Turn-OFF Time	t_{off}				70	500		70	500	
Charge Injection	Q	C_L = 1000pF, V_{GEN} = 0V, R_{GEN} = 0Ω (Figure 2)			10			10		pC
Source OFF Capacitance	$C_{S(off)}$	f = 140kHz, V_{in} = 5V or V_S = 0V	V_S = 0V		9.0			9.0		pF
Drain OFF Capacitance	$C_{D(off)}$		V_D = 0V		9.0			9.0		
Channel ON Capacitance	$C_{D(on)}$ + $C_{S(on)}$		V_D = V_S = 0V		25			25		
OFF Isolation Figure 3 (Note 5)		V_{in} = 5V, Z_L = 75Ω, V_S = 2.0V, f = 1MHz			75			75		dB
Crosstalk Figure 4 (Channel to Channel)					90			90		

ELECTRICAL CHARACTERISTICS (continued)

(V^+ = +15V, V^- = −15V, GND = 0V, T_A = 25°C, unless otherwise indicated.)

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS						UNITS
			DG200A			DG200 B/C/D			
			MIN (Note 2)	TYP (Note 3)	MAX	MIN (Note 2)	TYP (Note 3)	MAX	
SUPPLY									
Positive Supply Current	I+	Both Channels ON or OFF V_{in} = 0 and 2.4V		180	300		200	500	µA
Negative Supply Current	I−		−10	−0.1		−100	−0.1		

ELECTRICAL CHARACTERISTICS (Over Temperature)

(V^+ = +15V, V^- = −15V, GND = 0V, T_A = Over Temperature Range, unless otherwise indicated.)

PARAMETER	SYMBOL	TEST CONDITIONS		LIMITS					UNITS
				DG200A			DG200 B/C		
				MIN (Note 2)	TYP (Note 3)	MAX	MIN (Note 2)	TYP (Note 3)	MAX	
SWITCH										
Analog Signal Range (Note 1)	V_{ANALOG}			−15		15	−15		15	V
Drain-Source ON Resistance	$r_{DS(on)}$	V_D = ±10V, V_{in} = 0.8V, I_S = 1mA			100			100		Ω
Source OFF Leakage Current	$I_{S(off)}$	V_{in} = 2.4V	V_S = 14V, V_D = −14V		100			100		nA
			V_S = −14V, V_D = 14V	−100			−100			
Drain OFF Leakage Current	$I_{D(off)}$		V_S = −14V, V_D = 14V		100			100		
			V_S = 14V, V_D = −14V	−100			−100			
Drain ON Leakage Current (Note 4)	$I_{D(on)}$	V_{in} = 0.8V	V_S = V_D = 14V		200			200		
			V_S = V_D = −14V	−200			−200			
INPUT										
Input Current/ Voltage High	I_{INH}	V_{in} = 2.4V, V_{in} = 15V		−10			−10			µA
						10			10	
Input Current/ Voltage Low	I_{INL}	V_{in} = 0V		−10			−10			

Note 1: 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.

Note 2: The algebraic convention whereby the most negative value is a minimum, and the most positive is a maximum, is used in this data sheet.

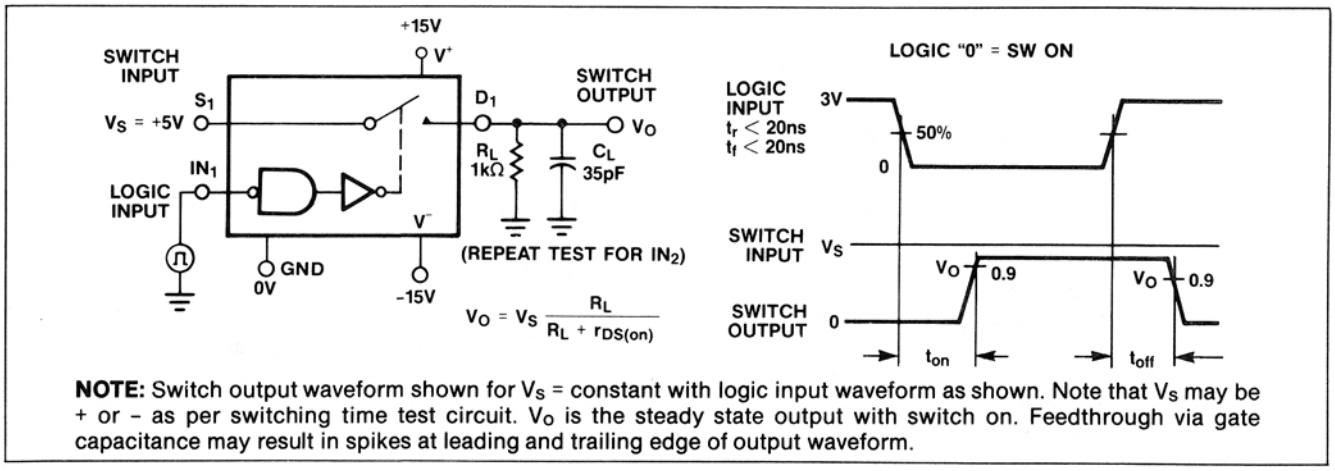
Note 3: Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

Note 4: $I_{D(on)}$ is leakage from driver into "ON" switch.

Note 5: "OFF" isolation = 20 log V_S/V_D, V_S = input to OFF switch, V_D = output.

Dual Monolithic SPST CMOS Analog Switch

Test Circuits



NOTE: Switch output waveform shown for V_S = 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.

Figure 1. Switching Time Test Circuit

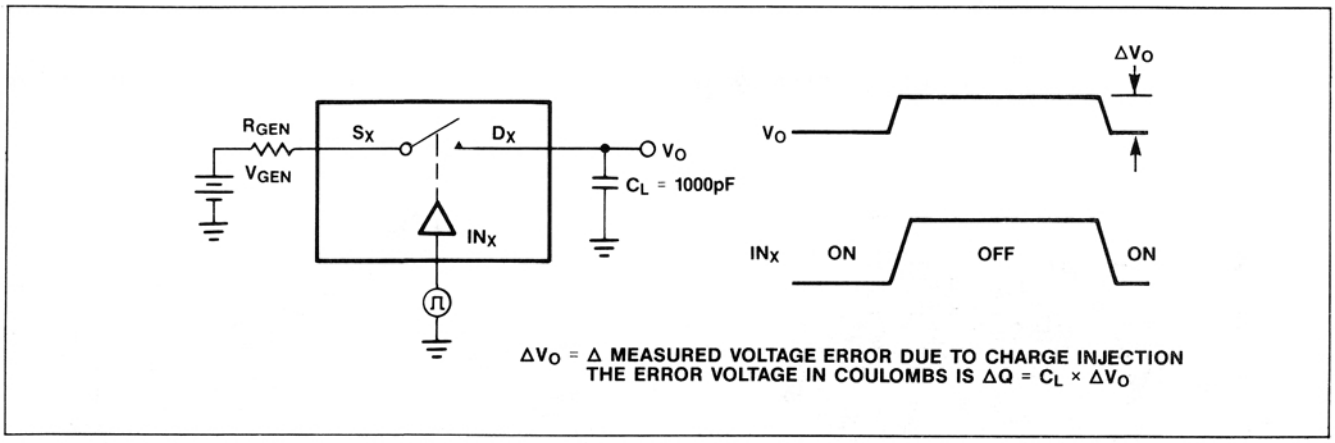


Figure 2. Charge Injection Test Circuit

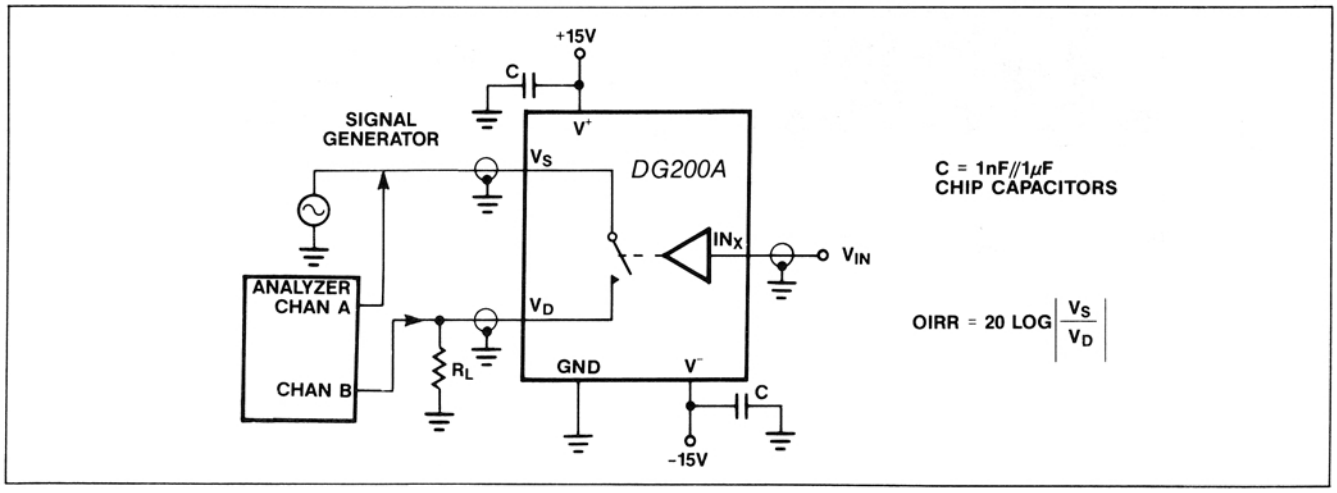


Figure 3. OFF Isolation Test Circuit

Dual Monolithic SPST CMOS Analog Switch

Test Circuits (continued)

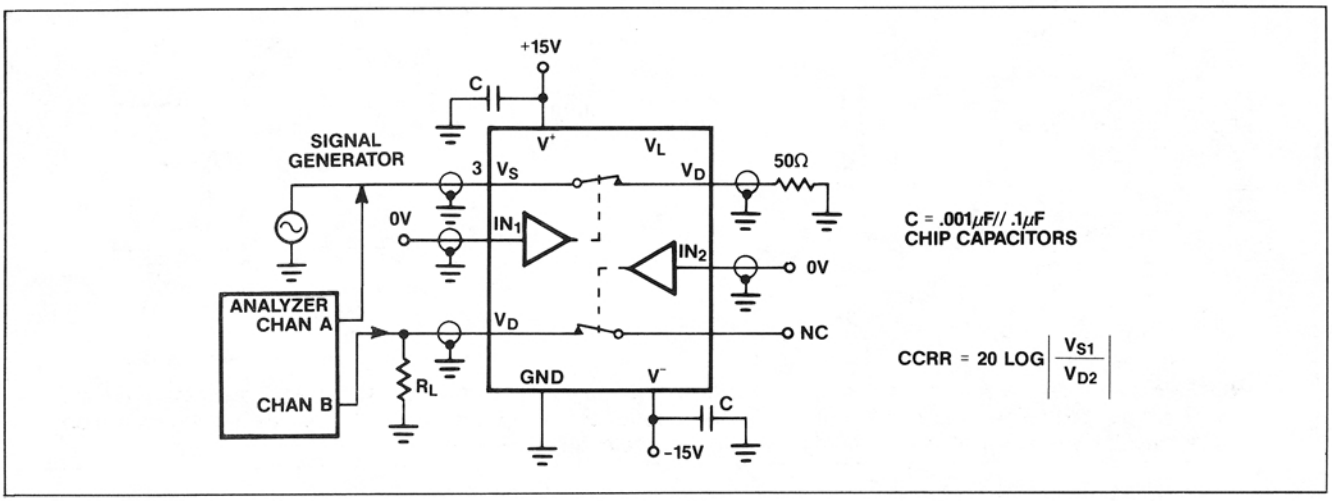
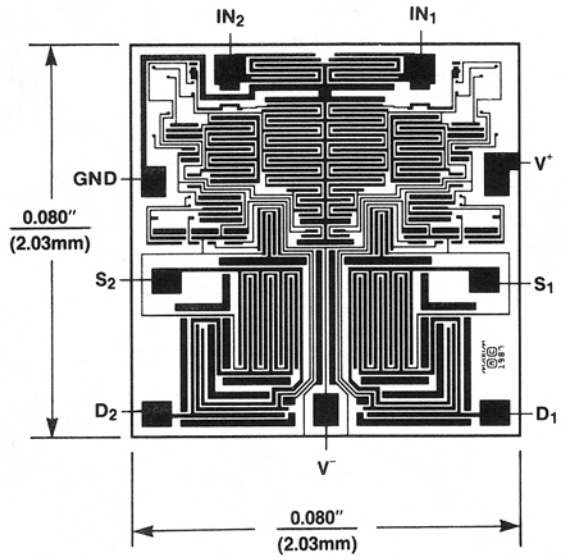
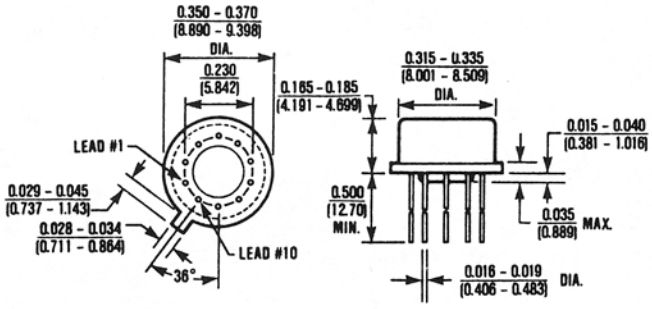


Figure 4. Channel To Channel Crosstalk Test Circuit

Chip Topography



Package Information



10 Lead TO-100 Can (TW)

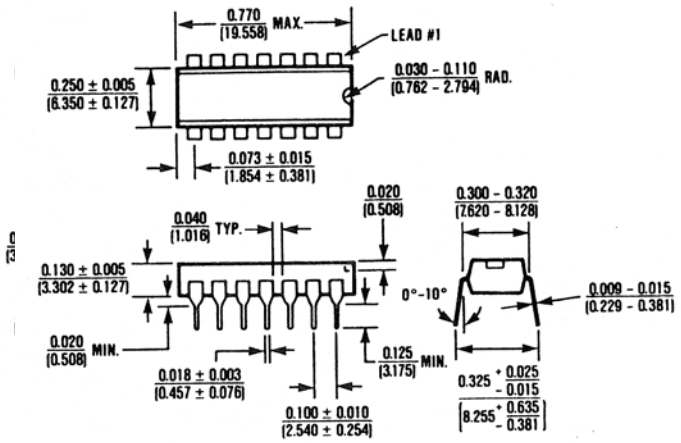
θ_{JA} = 150°C/W

θ_{JC} = 45°C/W

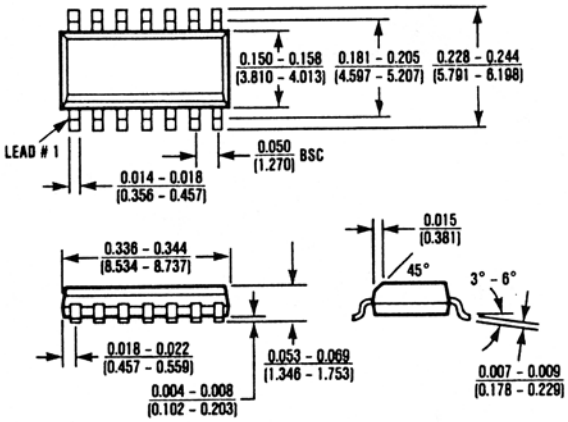
Dual Monolithic SPST CMOS Analog Switch

Package Information

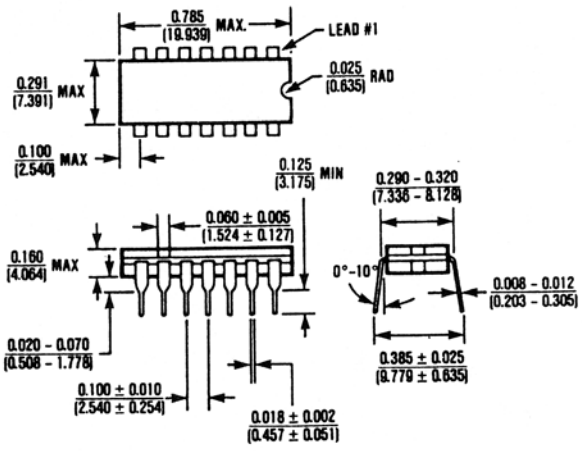
(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to **www.maxim-ic.com/packages**.)



14 Lead Plastic DIP (PD)
θ_{JA} = 140°C/W
θ_{JC} = 70°C/W



14 Lead Small Outline (SD)
θ_{JA} = 115°C/W
θ_{JC} = 60°C/W



14 Lead CERDIP (JD)
θ_{JA} = 105°C/W
θ_{JC} = 50°C/W