

MAXIM

Dual Monolithic SPST CMOS Analog Switch

DG200A

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 $\pm 4.5V$ to $\pm 18V$. 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

Features

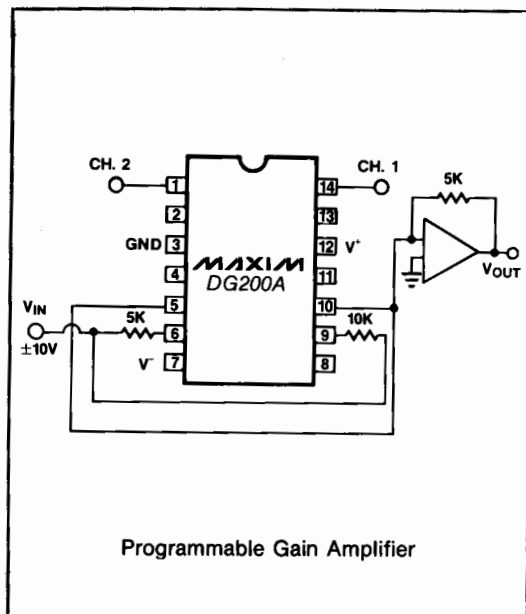
- ◆ Improved 2nd Source Power Supply Current $< 300\mu A$
- ◆ Wide Supply Range $\pm 4.5V$ to $\pm 18V$
- ◆ Single Supply Operation
- ◆ Non-Latching with Supplies Turned-off and Input Signals Present
- ◆ CMOS and TTL Logic Compatible
- ◆ Monolithic, Low Power CMOS Design

Ordering Information

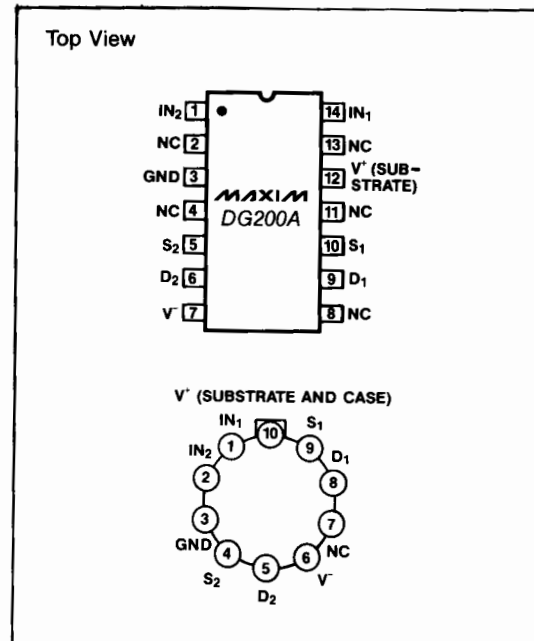
| PART | TEMP. RANGE | PIN-PACKAGE |
|-----------|-----------------|---------------------|
| DG200AAK | -55°C to +125°C | 14 Lead CERDIP |
| DG200ABK | -25°C to +85°C | 14 Lead CERDIP* |
| DG200ACK | 0°C to +70°C | 14 Lead CERDIP |
| DG200ACJ | 0°C to +70°C | 14 Lead Plastic DIP |
| DG200ADJ | -40°C 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.

Typical Operating Circuit



Pin Configuration



Dual Monolithic SPST CMOS Analog Switch

ABSOLUTE MAXIMUM RATINGS

| | | |
|---|---|--------------|
| Voltages Referenced to V ⁻ | Operating Temperature (A Suffix) | -55 to 125°C |
| V ⁺ | (B Suffix) | -25 to 85°C |
| GND | (C Suffix) | -25 to 85°C |
| Digital Inputs V _S , V _D (Note 1) | (D Suffix) | -40 to 85°C |
| or 20mA, whichever occurs first. | Power Dissipation (Package)* | |
| Current, Any Terminal Except S or D | Metal Can** | 450mW |
| Continuous Current, S or D | 14 Pin Ceramic DIP*** | 825mW |
| (Pulsed at 1msec, 10% duty cycle max) | 14 Pin Plastic DIP**** | 470mW |
| Storage Temperature (A & B Suffix) | * All leads soldered or welded to PC board. | |
| (C Suffix) | ** 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 | | | | | | UNITS |
|---|---|--|---|---------|-------|-------------|-------|-----|-------|
| | | | DG200A | | | DG200 B/C/D | | | |
| | | | MIN | TYP | MAX | MIN | TYP | 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 | 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 | |
| Drain OFF Leakage Current | I _{D(off)} | | 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 = -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 | | |
| 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 | |
| Input Current with Input Voltage Low | I _{NL} | 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 | | | | |

Dual Monolithic SPST CMOS Analog Switch

DG200A

ELECTRICAL CHARACTERISTICS (continued)

($V^+ = +15V$, $V^- = -15V$, GND = 0V, $T_A = 25^\circ C$, unless otherwise indicated.)

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

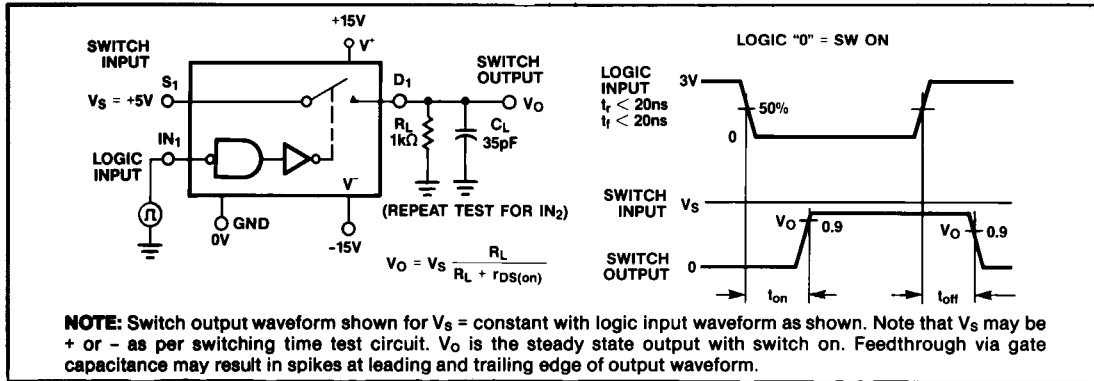


Figure 1. Switching Time Test Circuit

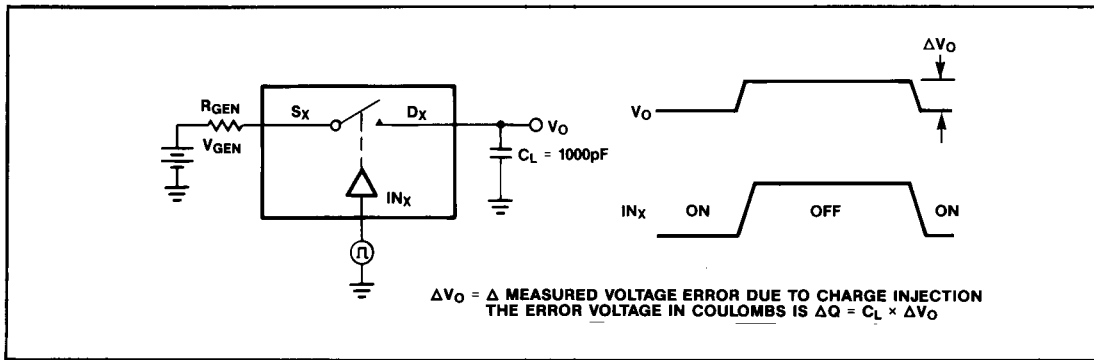


Figure 2. Charge Injection Test Circuit

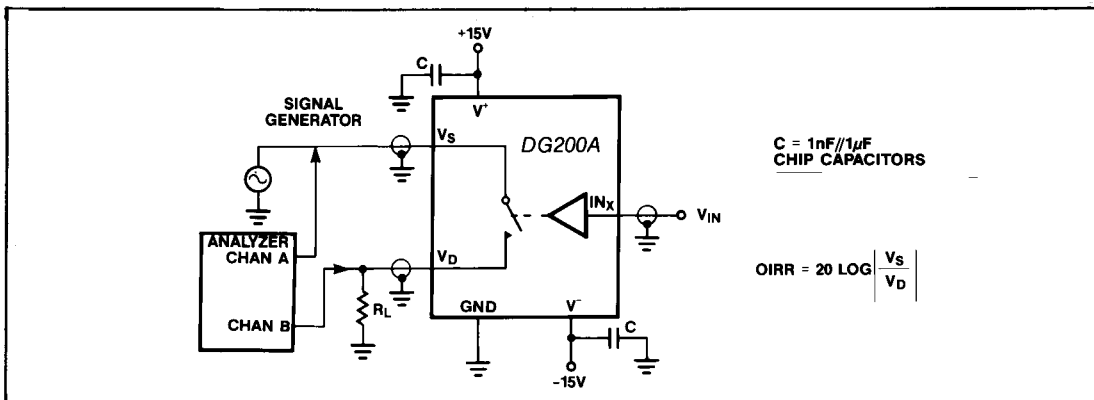


Figure 3. OFF Isolation Test Circuit

Dual Monolithic SPST CMOS Analog Switch

Test Circuits (continued)

DG200A

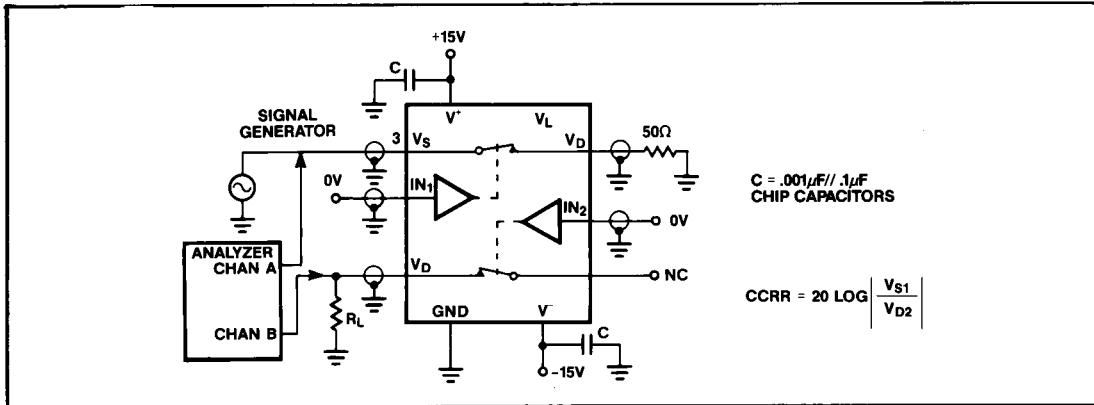
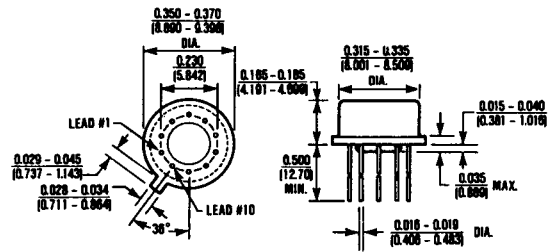
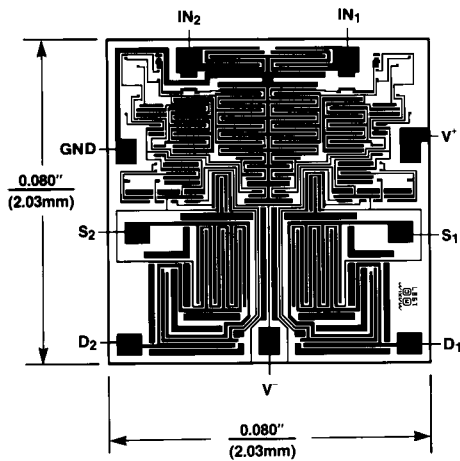


Figure 4. Channel To Channel Crosstalk Test Circuit

Chip Topography

Package Information



10 Lead TO-100 Can (TW)

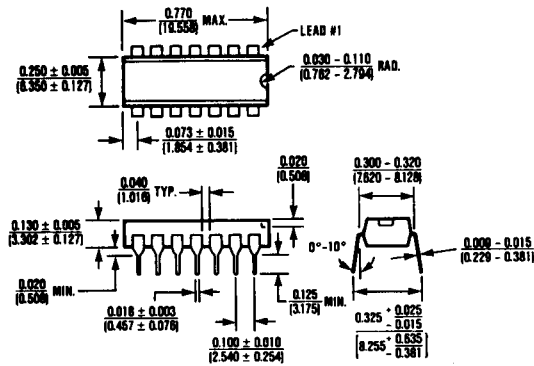
$\theta_{JA} = 150^{\circ}\text{C/W}$

$\theta_{JC} = 45^{\circ}\text{C/W}$

Dual Monolithic SPST CMOS Analog Switch

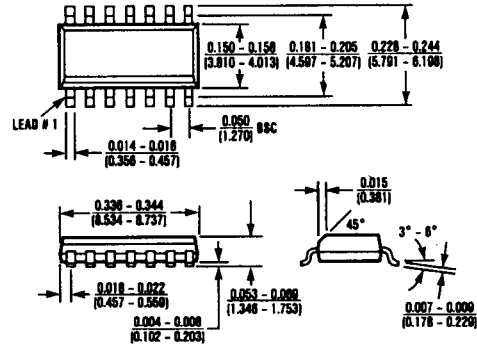
DG200A

Package Information



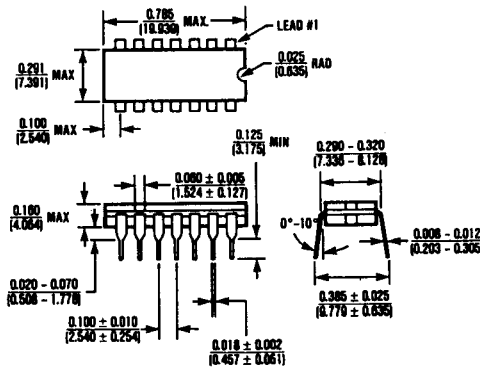
14 Lead Plastic DIP (PD)

$\theta_{JA} = 140^{\circ}\text{C/W}$
 $\theta_{JC} = 70^{\circ}\text{C/W}$



14 Lead Small Outline (SD)

$\theta_{JA} = 115^{\circ}\text{C/W}$
 $\theta_{JC} = 60^{\circ}\text{C/W}$



14 Lead Cerdip (JD)

$\theta_{JA} = 105^{\circ}\text{C/W}$
 $\theta_{JC} = 50^{\circ}\text{C/W}$

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

6 Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 (408) 737-7600

© 1996 Maxim Integrated Products

Printed USA

MAXIM is a registered trademark of Maxim Integrated Products.