# High-Speed Quad Monolithic SPST CMOS Analog Switch

## FEATURES

- Fast Switching $t_{ON}$: 55 ns
- Low Charge Injection: 5 pC
- Low $r_{DS(on)}$: 32 Ω
- TTL/CMOS Compatible
- Low Leakage: 50 pA

## BENEFITS

- Fast Settling Times
- Reduced Switching Glitches
- High Precision

## APPLICATIONS

- High-Speed Switching
- Sample/Hold
- Digital Filters
- Op Amp Gain Switching
- Flight Control Systems
- Automatic Test Equipment
- Choppers
- Communication Systems

## DESCRIPTION

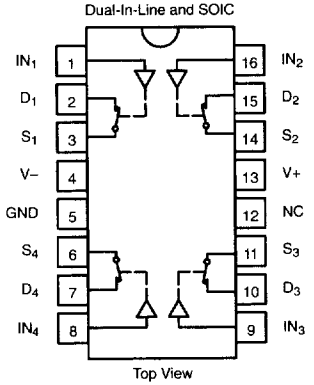
The DG271B high speed quad single-pole single-throw analog switch is intended for applications that require low on-resistance, low leakage currents, and fast switching speeds.

Built on the Vishay Siliconix' proprietary high voltage silicon gate process to achieve superior on/off performance, each switch conducts equally well in both directions when on, and blocks up to the supply voltage when off. An epitaxial layer prevents latchup.

The DG271B has a redesign internal regulator which improves start-up over the DG271.

## FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION

Dual-In-Line and SOIC




Top View

| 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** |
| 0 to 70°C | 16-Pin Plastic DIP | DG271BCJ |
| –40 to 85°C | 16-Pin Narrow SOIC | DG271BDY |



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## 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 20 mA, whichever occurs first
Current, Any Terminal ..... 30 mA
Peak Current, S or D
(Pulsed at 1 ms, 10% duty cycle max) ..... 100 mA
Storage Temperature (DY Suffix) ..... –65 to 150°C
(CJ Suffix) ..... –65 to 125°C

Power Dissipation (Package)b
16-Pin Plastic DIP[c] ..... 470 mW
16-Pin Plastic Narrow SOIC[d] ..... 600 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 75°C
d. Derate 7.6 mW/°C above 75°C

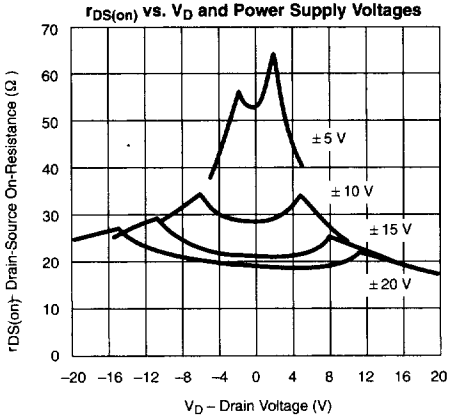
## SPECIFICATIONS[a]

| Parameter | Symbol | Test Conditions Unless Specified V+ = 15 V, V– = –15 V, $V_{IN}$ = 2.4 V, 0.8 V[f] | Temp[b] | C, D Suffix 0 to 70°C, –40 to 85°C Min[d] | Typ[c] | Max[d] | Unit |
|---|---|---|---|---|---|---|---|
| **Analog Switch** | | | | | | | |
| Analog Signal Range[e] | $V_{ANALOG}$ | | Full | –15 | | 15 | V |
| Drain-Source On-Resistance | $r_{DS(on)}$ | $I_S$ = 1 mA, $V_D$ = ± 10 V | Room<br>Full | | 32 | 50<br>75 | Ω |
| Switch Off Leakage Current | $I_{S(off)}$ | $V_D$ = ± 14 V, $V_S$ = ∓ 14 V | Room<br>Full | –1<br>–20 | ± 0.05 | 1<br>20 | nA |
| | $I_{D(off)}$ | | Room<br>Full | –1<br>–20 | ± 0.05 | 1<br>20 | |
| Channel On Leakage Current | $I_{D(on)}$ + $I_{S(on)}$ | $V_S$ = $V_D$ = ± 14 V | Room<br>Full | –1<br>–20 | ± 0.05 | 1<br>20 | |
| **Digital Control** | | | | | | | |
| Input Current with Voltage High | $I_{INH}$ | $V_{IN}$ = 2 V | Full | –1 | 0.010 | 1 | µA |
| | | $V_{IN}$ = 15 V | Full | –1 | 0.010 | 1 | |
| Input Current with Voltage Low | $I_{INL}$ | $V_{IN}$ = 0 V | Full | –1 | 0.010 | 1 | |
| **Dynamic Characteristics** | | | | | | | |
| Turn-On Time | $t_{ON}$ | $V_S$ = ± 10 V, See Figure 3 | Room<br>Full | | 55 | 65<br>80 | ns |
| Turn-Off Time | $t_{OFF}$ | | Room<br>Full | | 50 | 65<br>80 | |
| Charge Injection | Q | $C_L$ = 1 nF, $V_S$ = 0 V, $V_{gen}$ = 0 V, $R_{gen}$ = 0 Ω, See Figure 3 | Room | | –5 | | pC |
| Source Off Capacitance | $C_{S(off)}$ | $V_S$ = 0 V, $V_{IN}$ = 5 V, f = 1 MHz | Room | | 8 | | pF |
| Drain Off Capacitance | $C_{D(off)}$ | | Room | | 8 | | |
| Channel On Capacitance | $C_{D(on)}$ | $V_D$ = $V_S$ = 0 V, $V_{IN}$ = 0 V | Room | | 30 | | |
| Off Isolation | OIRR | $C_L$ = 10 pF, $R_L$ = 1 kΩ, f = 100 kHz, See Figures 4 and 5 | Room | | 85 | | dB |
| Crosstalk | $X_{TALK}$ | | Room | | 100 | | |
| **Supply** | | | | | | | |
| Positive Supply Current | I+ | All Channels On or Off, $V_{IN}$ = 5 V or 0 V | Room<br>Full | | 5.5 | 7.5<br>9 | mA |
| Negative Supply Current | I– | | Room<br>Full | –6<br>–8 | –3.4 | | |

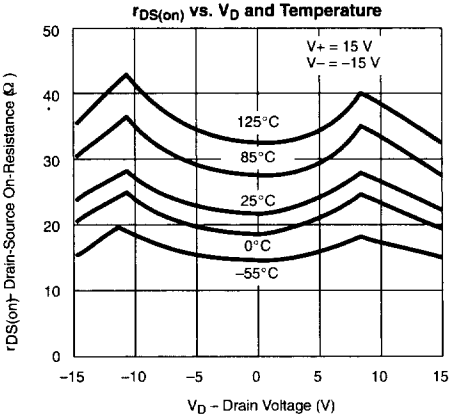
Notes:
a. Refer to PROCESS OPTION FLOWCHART.
b. Room = 25°C, Full = as determined by the operating temperature suffix.
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
d. The algebraic convention whereby the most negative value is a minimum and the most positive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

## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

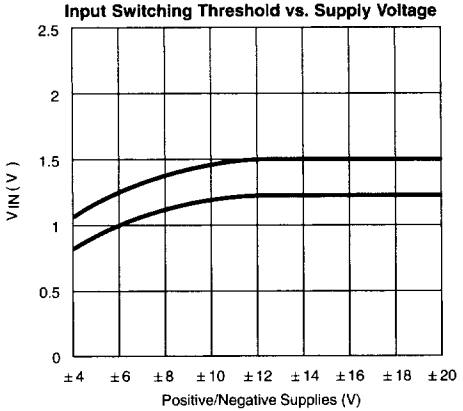
**$r_{DS(on)}$ vs. $V_D$ and Power Supply Voltages**



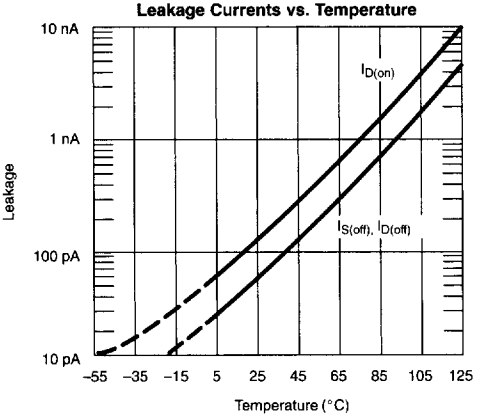

**$r_{DS(on)}$ vs. $V_D$ and Temperature**



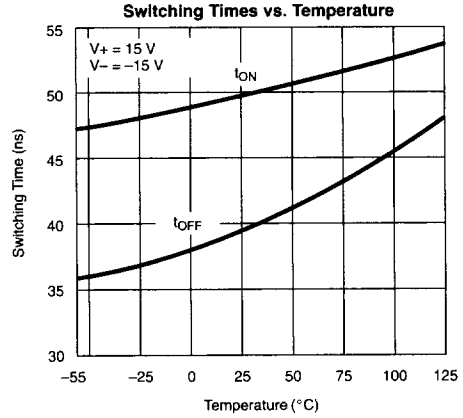

**Input Switching Threshold vs. Supply Voltage**



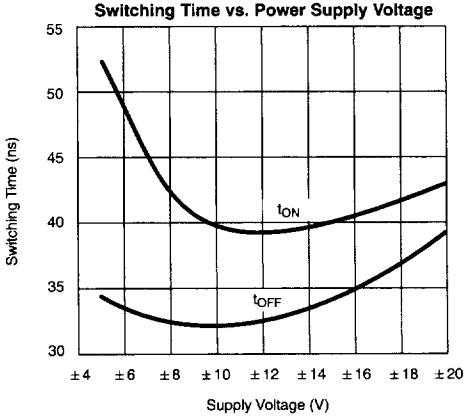

**Leakage Currents vs. Temperature**




**Switching Times vs. Temperature**




**Switching Time vs. Power Supply Voltage**



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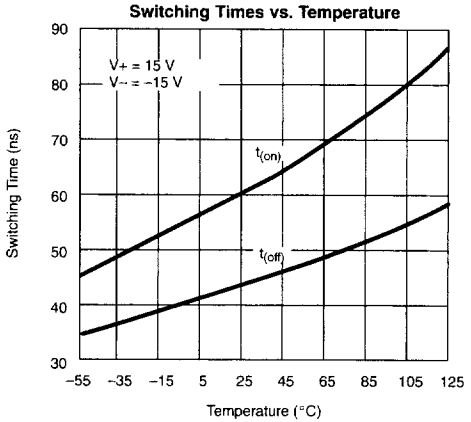
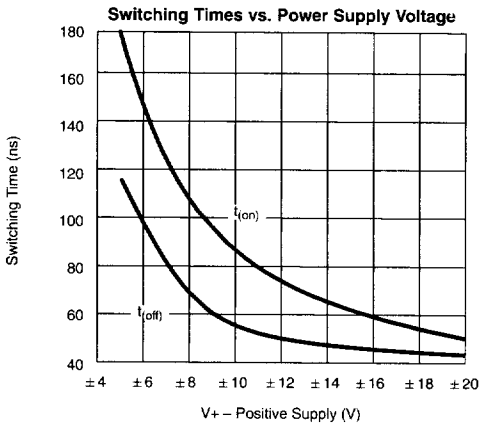



## SCHEMATIC DIAGRAM (TYPICAL CHANNEL)

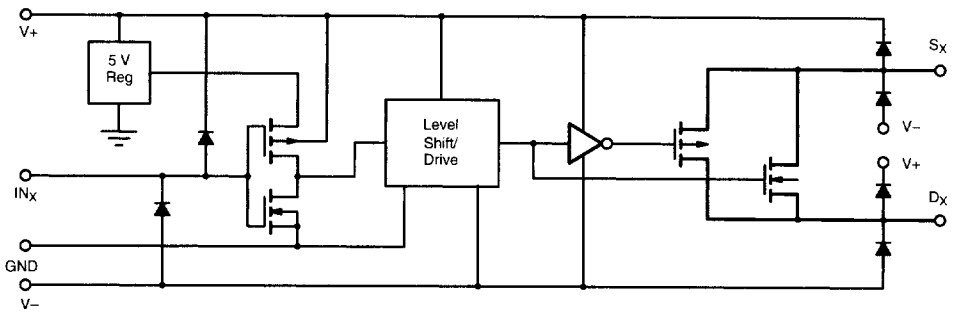
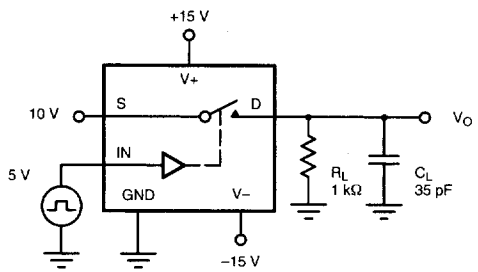



**FIGURE 1.**

## TEST CIRCUITS



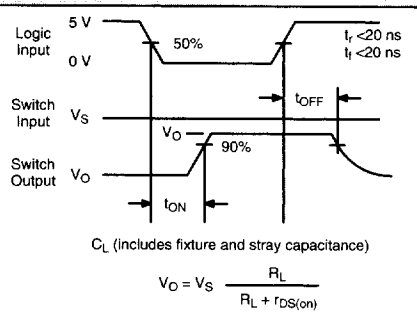




**FIGURE 2.** Switching Time