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.

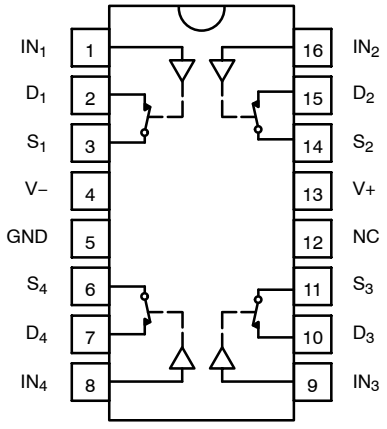
Built on the Vishay Siliconix' proprietary high voltage silicon gate process to achieve superior on/off performance, each switch conducts equally well in both directions when on, and blocks up to the supply voltage when off. An epitaxial layer prevents latchup.

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

As a committed partner to the community and the environment, Vishay Siliconix manufactures this product with the lead (Pb)-free device terminations. For analog switching products manufactured with 100% matte tin device terminations, the lead (Pb)-free "—E3" suffix is being used as a designator.

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—E3
–40 to 85°C	16-Pin Narrow SOIC	DG271BDY—E3
		DG271BDY-T1—E3 (with Tape and Reel)

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

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.

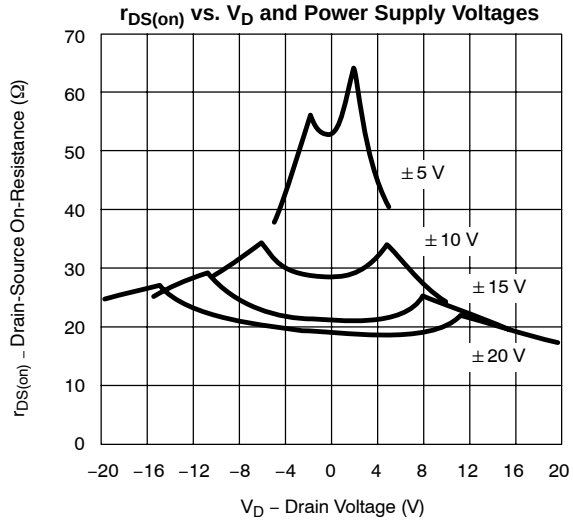
SPECIFICATIONS[a]

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 Full		32	50 75	Ω
Switch Off Leakage Current	$I_{S(off)}$	V_D = ±14 V, V_S = ∓14 V	Room Full	–1 –20	±0.05	1 20	nA
	$I_{D(off)}$		Room Full	–1 –20	±0.05	1 20	
Channel On Leakage Current	$I_{D(on)}$ + $I_{S(on)}$	V_S = V_D = ±14 V	Room Full	–1 –20	±0.05	1 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 Full		55	65 80	ns
Turn-Off Time	t_{OFF}		Room Full		50	65 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 Full		5.5	7.5 9	mA
Negative Supply Current	I–		Room Full	–6 –8	–3.4		

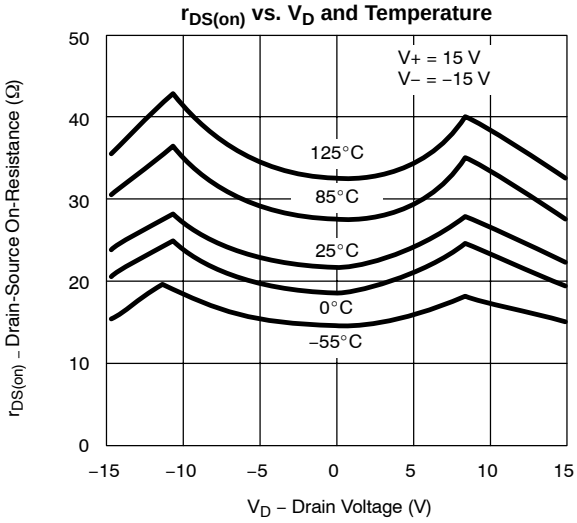
Notes:
a. Refer to PROCESS OPTION FLOWCHART.
b. Room = 25°C, Full = as determined by the operating temperature suffix.
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
d. The algebraic convention whereby the most negative value is a minimum and the most positive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

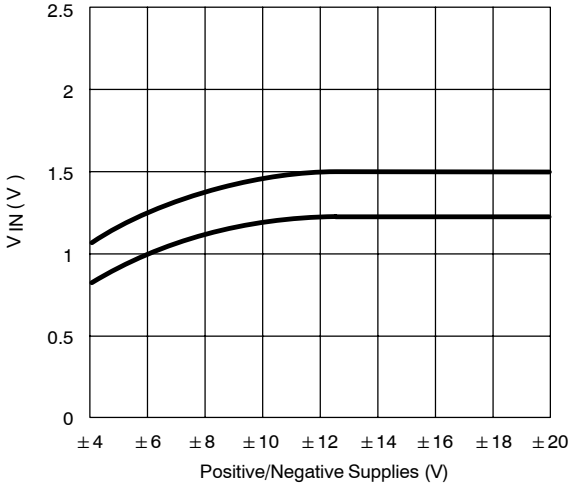
$r_{DS(on)}$ vs. V_D and Power Supply Voltages



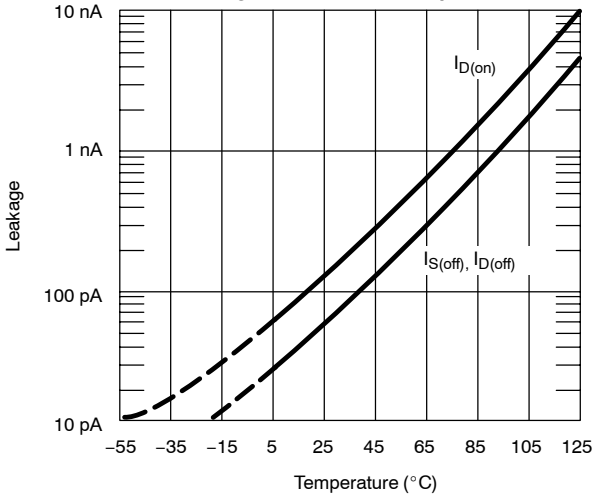
$r_{DS(on)}$ vs. V_D and Temperature



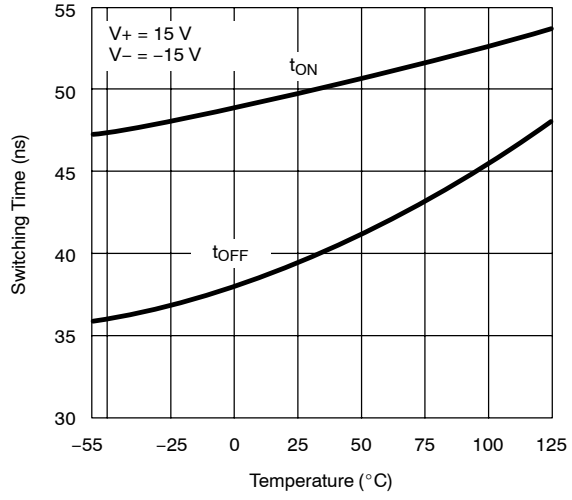
Input Switching Threshold vs. Supply Voltage



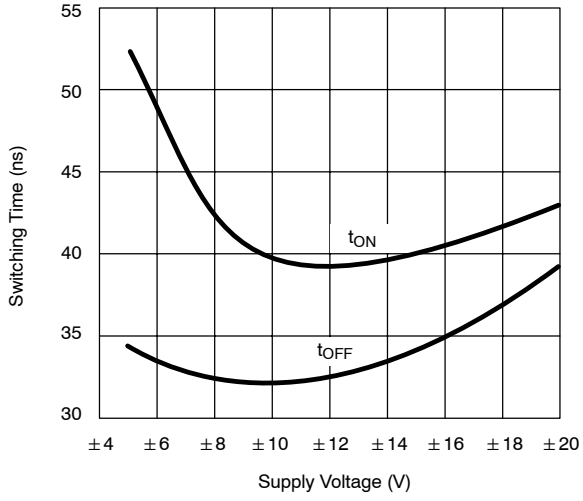
Leakage Currents vs. Temperature



Switching Times vs. Temperature



Switching Time vs. Power Supply Voltage



SCHEMATIC DIAGRAM (TYPICAL CHANNEL)

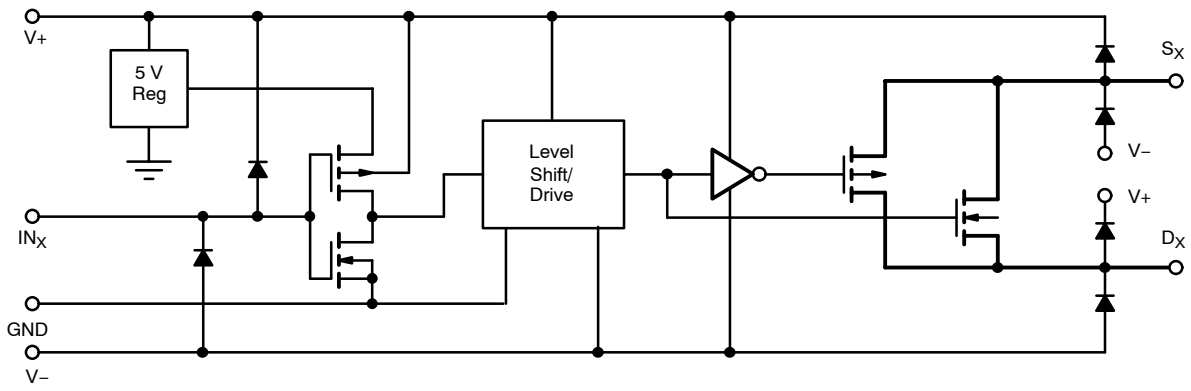


FIGURE 1.

TEST CIRCUITS

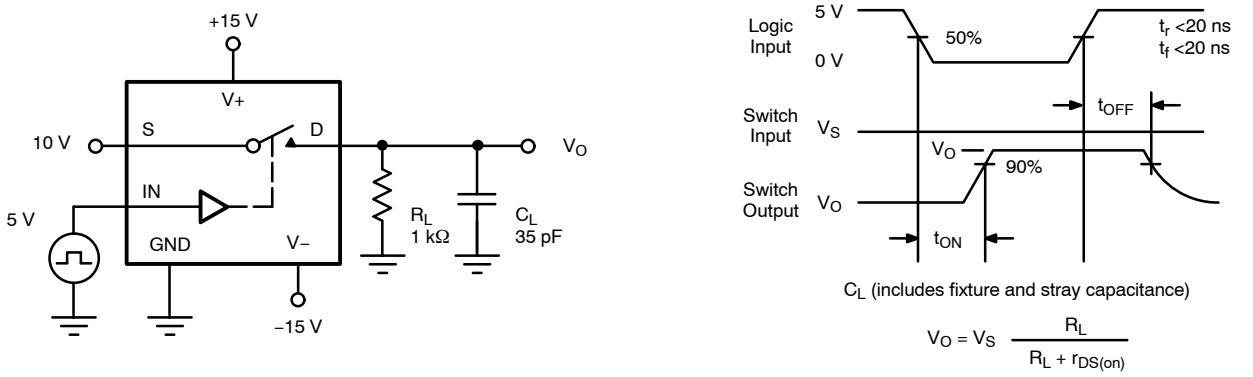


FIGURE 2. Switching Time

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