Quad Monolithic SPST CMOS Analog Switches

DESCRIPTION

Featuring low on-resistance (60 Ω) and fast switching (130 ns), the DG308A is supplied in the “normally open” configuration while DG309 is supplied “normally closed”. Input thresholds are high voltage CMOS compatible.

Designed with the Vishay Siliconix PLUS-40 CMOS process to combine low power dissipation with a high breakdown voltage rating of 44 V, each switch conducts equally well in both directions when on, and blocks up to the supply voltage when off. An epitaxial layer prevents latch up.

The DG308B/309B upgrades are recommended for new designs.

FEATURES

- ± 15 V Analog Input Range
- Low On-Resistance: 60 Ω
- Fast Switching: 130 ns
- Low Power Dissipation: 30 nW
- CMOS Logic Compatible

Pb-free Available

RoHS*
COMPLIANT

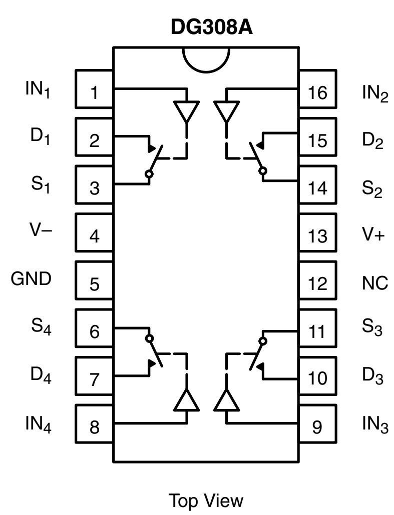
BENEFITS

- Full Rail-to-Rail Analog Signal Range
- Low Signal Error
- Wide Dynamic Range
- Single or Dual Supply Capability
- Static Protected Logic Inputs
- Space Savings (TSSOP)

APPLICATIONS

- Portable and Battery Powered Instrumentation
- Communication Systems
- Computer Peripherals
- High-Speed Multiplexing

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION



For SPST Switches per Package

TRUTH TABLE

Logic	DG308A	DG309
0	OFF	ON
1	ON	OFF

Logic "0" ≤ 3.5 V
Logic "1" ≥ 11 V

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

ORDERING INFORMATION

Temp Range	Package	Part Number
0 to 70 °C	16-Pin Plastic DIP	DG308ACJ DG308ACJ-E3
		DG309CJ DG309CJ-E3
- 40 to 85 °C	16-Pin Narrow SOIC	DG308ADY DG308ADY-E3 DG308ADY-T1 DG308ADY-T1-E3
		DG309DY DG309DY-E3 DG309DY-T1 DG309DY-T1-E3
	16-Pin TSSOP	DG308ADQ DG308ADQ-E3 DG308ADQ-T1 DG308ADQ-T1-E3
		DG309DQ DG309DQ-E3 DG309DQ-T1 DG309DQ-T1-E3

ABSOLUTE MAXIMUM RATINGS

Parameter		Limit	Unit
Voltages Referenced V+ to V-		44	V
GND		25	
Digital Inputs[a], V_S, V_D		(V-) - 2 to (V+) + 2 or 20 mA, whichever occurs first	
Current, Any Terminal Except S or D		30	mA
Continuous Current	S or D	20	
	(Pulsed at 1 ms, 10 % duty cycle max)	70	
Storage Temperature	(AK Suffix)	- 65 to 150	°C
	(CJ, DY and DQ Suffix)	- 65 to 125	
Power Dissipation[b]	16-Pin Plastic DIP[c]	470	mW
	16-Pin Narrow SOIC and TSSOP[e]	600	
	16-Pin CerDIP[d]	900	

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 12 mW/°C above 75 °C.
d. Derate 6.5 mW/°C above 25 °C.
e. Derate 7.6 mW/°C above 75 °C.

SCHEMATIC DIAGRAM (TYPICAL CHANNEL)

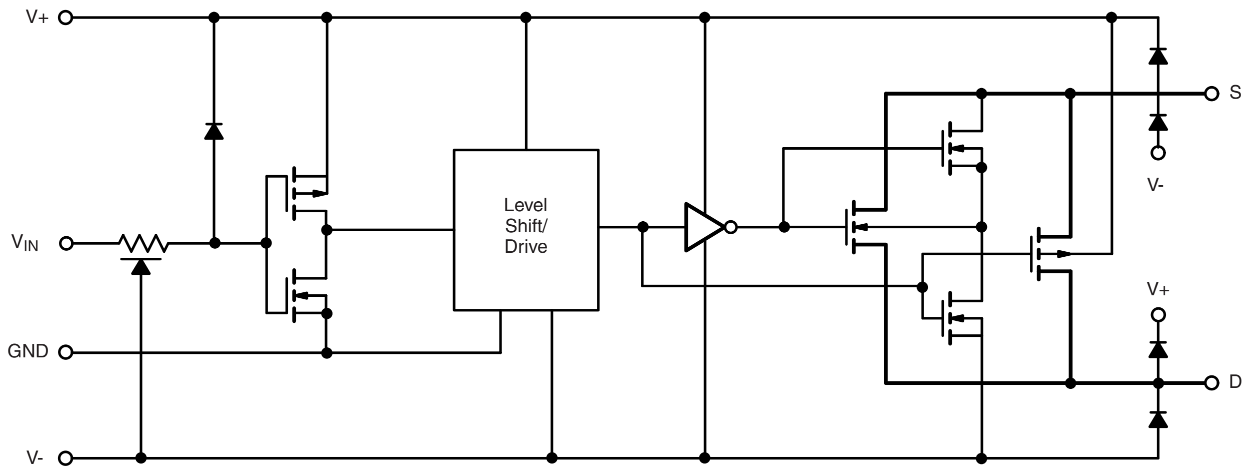


Figure 1.

SPECIFICATIONS[a]

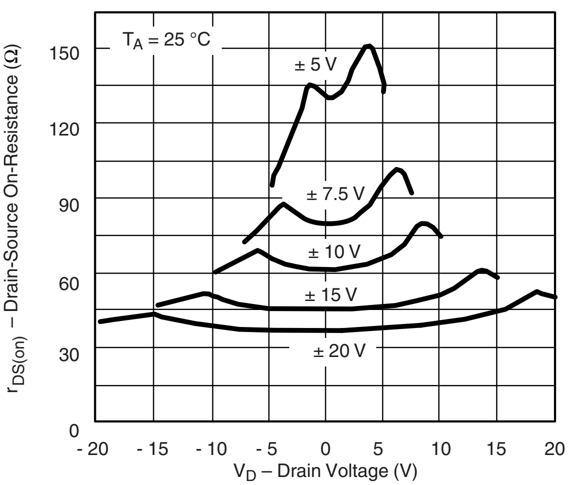
Parameter	Symbol	Test Conditions Unless Specified V+ = 15 V, V- = - 15 V V_{IN} = 3.5 V or 11 V[f]	Temp[b]	Typ[c]	A Suffix - 55 to 125°C Min[d]	A Suffix Max[d]	C, D Suffix Min[d]	C, D Suffix Max[d]	Unit
Analog Switch									
Analog Signal Range[e]	V_{ANALOG}		Full		- 15	15	- 15	15	V
Drain-Source On-Resistance	$r_{DS(on)}$	$V_D = \pm 10$ V, $I_S = 1$ mA	Room Full	60		100 150		100 125	Ω
Source Off Leakage Current	$I_{S(off)}$	$V_S = \pm 14$ V, $V_D = \pm 14$ V	Room Full	± 0.1	- 1 100	1 100	- 5 - 100	5 100	nA
Drain Off Leakage Current	$I_{D(off)}$	$V_D = \pm 14$ V, $V_S = \pm 14$ V	Room Full	± 0.1	- 1 100	1 100	- 5 - 100	5 100	nA
Drain On Leakage Current	$I_{D(on)}$	$V_D = V_S = \pm 14$ V	Room Full	± 0.1	- 1 100	1 100	- 5 - 200	5 200	nA
Digital Control									
Input Current with Input Voltage High	I_{INH}	V_{IN} = 15 V	Full	0.001		1		1	µA
Input Current with Input Voltage Low	I_{INL}	V_{IN} = 0 V	Full	- 0.001	- 1		- 1		µA
Input Capacitance	C_{IN}		Room	8					pF
Dynamic Characteristics									
Turn-On Time	t_{ON}	See Figure 2	Room	130		200		200	ns
Turn-Off Time	t_{OFF}	See Figure 2	Room	90		150		150	ns
Charge Injection	Q	C_L = 0.01 µF, R_{gen} = 0 Ω, V_{gen} = 0 V,	Room	- 10					pC
Source-Off Capacitance	$C_{S(off)}$	f = 140 kHz, V_S, V_D = 0 V	Room	11					pF
Drain-Off Capacitance	$C_{D(off)}$	f = 140 kHz, V_S, V_D = 0 V	Room	8					pF
Channel-On Capacitance	$C_{D(on)}$	f = 140 kHz, V_S, V_D = 0 V	Room	27					pF
Off-Isolation[f]	OIRR	R_L = 75 Ω, V_S = 2 V_{p-p}, f = 500 kHz	Room	78					dB

SPECIFICATIONS[a]									
		Test Conditions Unless Specified V+ = 15 V, V- = - 15 V V_{IN} = 3.5 V or 11 V[f]			**A Suffix** - 55 to 125°C		**C, D Suffix**		
Parameter	**Symbol**		**Temp**[b]	**Typ**[c]	**Min**[d]	**Max**[d]	**Min**[d]	**Max**[d]	**Unit**
Power Supplies									
Positive Supply Current	I+	All Channels On or Off V_{IN} = 0 V or 15 V	Room Full	0.001		10 100		10 100	µA
Negative Supply Current	I-		Room Full	- 0.001	- 10 - 100		- 100		

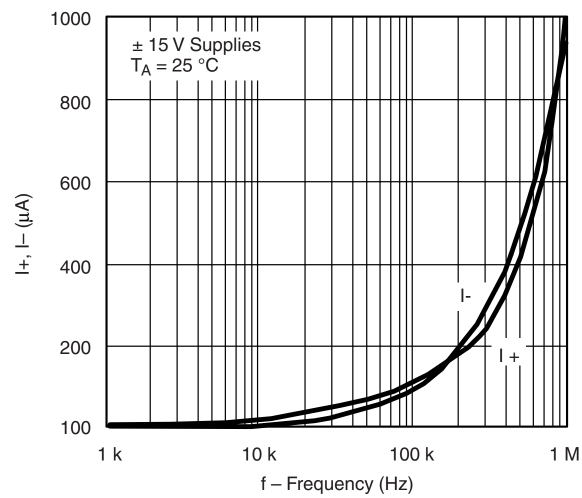
Notes:
a. Refer to PROCESS OPTION FLOWCHART.
b. Room = 25 °C, Full = as determined by the operating temperature suffix.
c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
d. The algebraic convention whereby the most negative value is a minimum and the most positive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

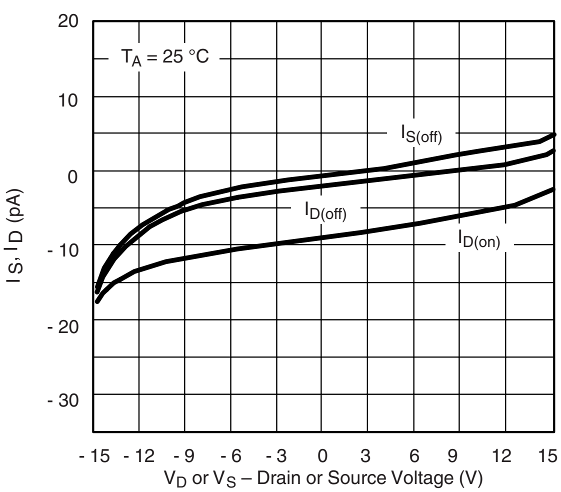
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



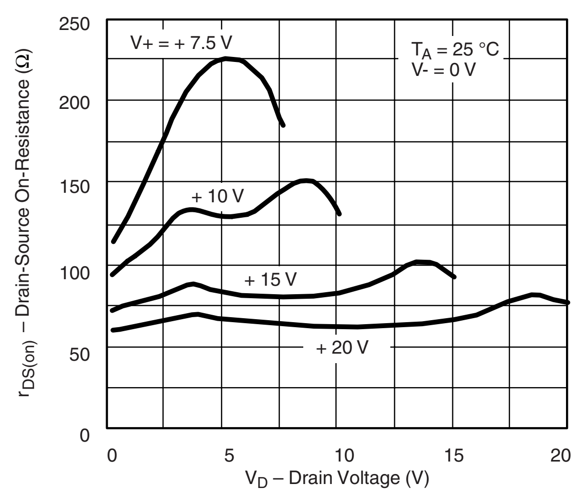
$r_{DS(on)}$ **vs.** V_D **and Power Supply**



Supply Currents vs. Switching Frequency (All Inputs Active)

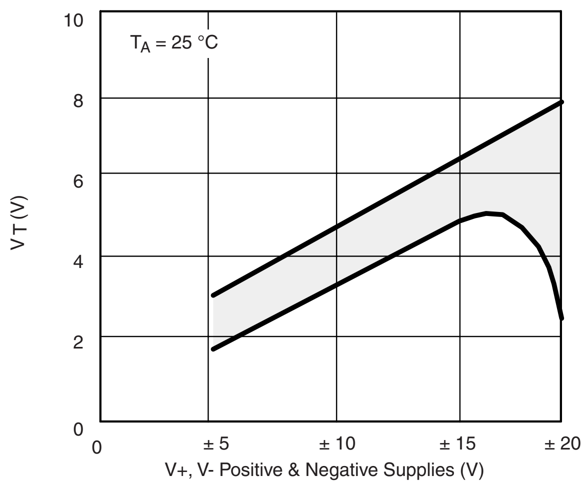


Leakage Currents vs. Analog Voltage

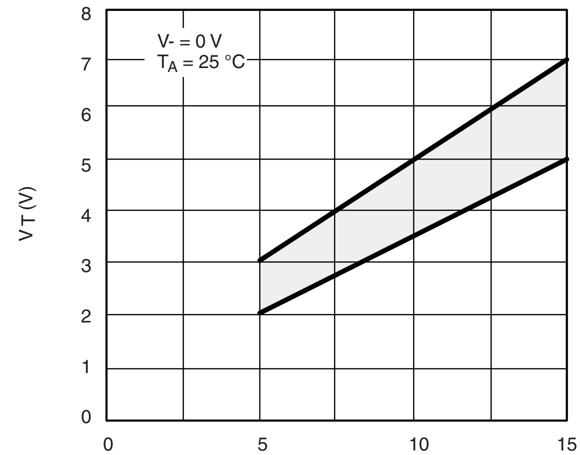


$r_{DS(on)}$ **vs.** V_D **and Power Supply Voltage**

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

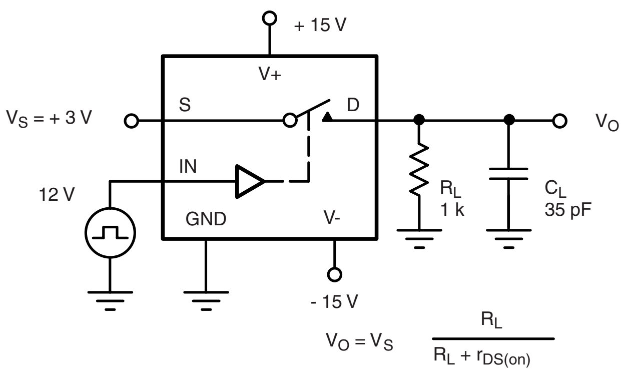


Input Switching Threshold vs. V+ and V- Supply Voltages



Input Switching Threshold vs. Positive Supply Voltage

TEST CIRCUITS



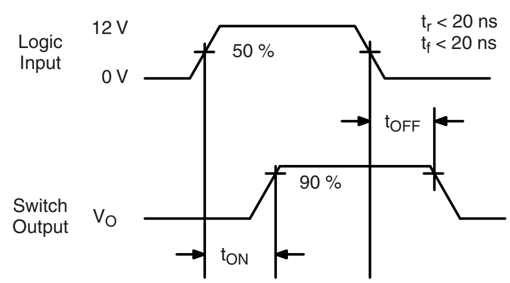


Figure 2. Switching Time

APPLICATIONS

Single Supply Operation

The DG308A and DG309 will switch positive analog signals while using a single positive supply. This will allow use in many applications where only one supply is available. The trade-offs or performance given up while using single supplies are: 1) increased $r_{DS(on)}$ and 2) slower switching speed. As stated in the absolute maximum ratings section of the data sheet, the analog voltage should not go above or below the supply voltages which in single supply operation are V+ and 0 V.

Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.