

# High-Speed Analog N-Channel DMOS FETs Improved On-Resistance



## SD310 / SD312 / SD314

### FEATURES

- High Input to Output Isolation ..... 120dB
- Low On Resistance ..... 15 Ohms @ 15V
- Low Feedthrough and Feedback Transients
- Low Capacitance:
  - Input (Gate) ..... 2.4pF typ.
  - Output ..... 1.3pF typ.
  - Feedback ..... 0.3pF typ.
- No Protection Diode from Gate to Substrate for very high impedance applications
- Maximum Gate Voltage .....  $\pm 40V$

### APPLICATIONS

#### SD310:

- Analog Switch Driver

#### SD312 and SD314:

- Analog Switches
- High-Speed Digital Switches
- Multiplexers
- A to D Converters
- D to A Converters
- Choppers
- Sample & Hold

### DESCRIPTION

The Calogic SD310 is a 30V analog switch driver without a built-in protection diode from gate to substrate for use with SD312 and SD314 DMOS analog switches.

The SD312 is a high performance, high-speed, high-voltage, and low resistance analog switch capable of switching  $\pm 5V$  signals. The maximum threshold of 2V permits simple direct TTL or CMOS driving for small applications.

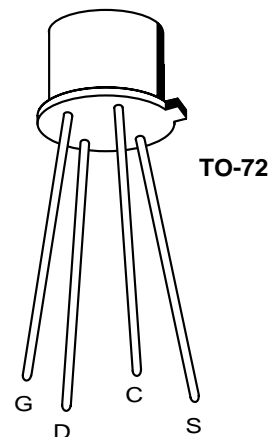
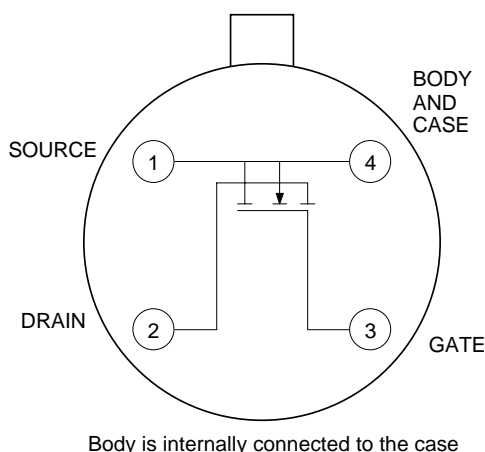
The SD314 is DMOS analog switch capable of switching  $\pm 10V$  analog signals with all other parameters identical to those of SD312.

All three devices are manufactured with an implanted high-speed, high-voltage, and low resistance double-diffused MOS (DMOS) process. SD310, SD312 and SD314 devices also have no built-in protection diode to enhance performance in high impedance circuits. The devices are available in 4-lead hermetic TO-72 package and in die form for hybrid applications. Custom devices based on SD310, SD312 and SD314 can also be ordered.

### ORDERING INFORMATION

Part	Package	Temperature Range
SD310DE	Hermetic TO-72 Package	-55°C to +125°C
SD312DE	Hermetic TO-72 Package	-55°C to +125°C
SD314DE	Hermetic TO-72 Package	-55°C to +125°C
XSD310	Sorted Chips in Carriers	-55°C to +125°C
XSD312	Sorted Chips in Carriers	-55°C to +125°C
XSD314	Sorted Chips in Carriers	-55°C to +125°C

### SCHEMATIC DIAGRAM (Top View)





**ABSOLUTE MAXIMUM RATINGS**

Drain Current . . . . . 50mA  
 Total Device Dissipation at 25°C Case Temperature . . . 1.2W  
 Storage Temperature Range . . . . . -65° to +200°C  
 Lead Temperature (1/16" from case for 10 sec.) . . . . . 300°C  
 Operating Temperature Range . . . . . -55°C to +125°C

PARAMETER		SD310	SD312	SD314	UNIT
V <sub>DS</sub>	Drain-to-source	+30	+10	+20	V <sub>dc</sub>
V <sub>SD</sub>	Source-to-drain*	+10	+10	+20	V <sub>dc</sub>
V <sub>DB</sub>	Drain-to-body	+30	+15	+25	V <sub>dc</sub>
V <sub>SB</sub>	Source-to-body	+15	+15	+25	V <sub>dc</sub>
V <sub>GS</sub>	Gate-to-source	±40	±40	±40	V <sub>dc</sub>
V <sub>GB</sub>	Gate-to-body	±40	±40	±40	V <sub>dc</sub>
V <sub>GD</sub>	Gate-to-drain	±40	±40	±40	V <sub>dc</sub>

**DC ELECTRICAL CHARACTERISTICS** (T<sub>A</sub> = 25°C, unless other specified.)

SYMBOL	PARAMETER	SD310			SD312			SD314			UNITS	TEST CONDITIONS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
<b>BREAKDOWN VOLTAGE</b>												
BV <sub>DS</sub>	Drain-to-source	30	35								V	V <sub>GS</sub> = V <sub>BS</sub> = 0V, I <sub>D</sub> = 10μA
		10	25		10	25		20	25			V <sub>GS</sub> = V <sub>BS</sub> = -5V, I <sub>S</sub> = 10nA
BV <sub>SD</sub>	Source-to drain	10			10			20				V <sub>GD</sub> = V <sub>BD</sub> = -5V, I <sub>D</sub> = 10nA
BV <sub>DB</sub>	Drain-to-body				15				25			V <sub>GB</sub> = 0V, source OPEN, I <sub>D</sub> = 10nA
BV <sub>SB</sub>	Source-to-body	15			15			25				V <sub>GB</sub> = 0V, drain OPEN, I <sub>S</sub> = 10μA
<b>LEAKAGE CURRENT</b>												
I <sub>DS</sub> (OFF)	Drain-to-source		1	10		1	10				nA	V <sub>GS</sub> = V <sub>BS</sub> = -5V, V <sub>DS</sub> = +10V
								1	10			V <sub>GS</sub> = V <sub>BS</sub> = -5V, V <sub>DS</sub> = +20V
I <sub>SD</sub> (OFF)	Source-to-drain		1	10		1	10					V <sub>GS</sub> = V <sub>BD</sub> = -5V, V <sub>SD</sub> = +10V
								1	10			V <sub>GS</sub> = V <sub>BD</sub> = -5V, V <sub>SD</sub> = +20V
I <sub>GBS</sub>	Gate			0.1			0.1			0.1		V <sub>DB</sub> = V <sub>SB</sub> = 0V, V <sub>GS</sub> = ±40V
V <sub>T</sub>	Threshold voltage	0.5	1.0	2.0	0.5	1.0	2.0	0.5	1.0	2.0	V	V <sub>DS</sub> = V <sub>GS</sub> = V <sub>T</sub> , I <sub>S</sub> = 1μA, V <sub>SB</sub> = 0V
r <sub>DS</sub> (ON)	Drain-to-source resistance		30	50		30	50		30	50	Ω	I <sub>D</sub> = 1.0mA, V <sub>SB</sub> = 0, V <sub>GS</sub> = +5V
			20	35		20	35		20	35		I <sub>D</sub> = 1.0mA, V <sub>SB</sub> = 0, V <sub>GS</sub> = +10V
			15	25		15			15			I <sub>D</sub> = 1.0mA, V <sub>SB</sub> = 0, V <sub>GS</sub> = +15V

**AC ELECTRICAL CHARACTERISTICS**

SYMBOL	PARAMETER	SD310			SD312			SD314			UNITS	TEST CONDITIONS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
g <sub>fs</sub>	Forward transconductance	15	20		15	20		15	20		mmhos	V <sub>DS</sub> = 10V, V <sub>SB</sub> = 0V, I <sub>D</sub> = 20mA, f = 1kHz
<b>SMALL SIGNAL CAPACITANCES</b> (See capacitance model)												
C <sub>(GS+GD+GB)</sub>	Gate node		2.4	3.7		2.4	3.7		2.4	3.7	pF	V <sub>DS</sub> = 10V, f = 1MHz V <sub>GS</sub> = V <sub>BS</sub> = -15V
C <sub>(GD+DB)</sub>	Drain node		1.3	1.7		1.3	1.7		1.3	1.7		
C <sub>(GS+SB)</sub>	Source node		3.5	4.5		3.5	4.5		3.5	4.5		
C <sub>DG</sub>	Reverse transfer		0.3	0.7		0.3	0.7		0.3	0.7		

