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

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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** . . . . **±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 ±5V signals. The maximum threshold of 2V permits simple direct TTL an CMOS driving for small applications.
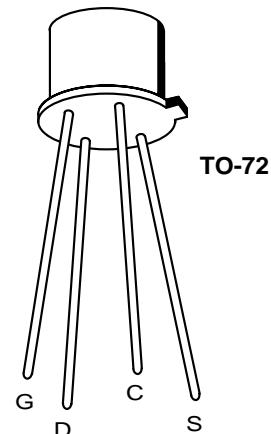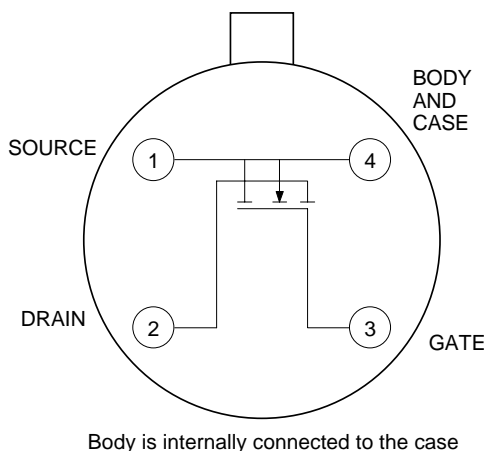
The SD314 is DMOS analog switch capable of switching ±10V analog signals with all other parameters identical to those of SD312.

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)

SOURCE 1   4 BODY AND CASE

DRAIN 2   3 GATE

Body is internally connected to the case

TO-72

G   C   D   S

CD10-2

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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_{DS}	Drain-to-source	+30	+10	+20	V_{dc}
V_{SD}	Source-to-drain*	+10	+10	+20	V_{dc}
V_{DB}	Drain-to-body	+30	+15	+25	V_{dc}
V_{SB}	Source-to-body	+15	+15	+25	V_{dc}
V_{GS}	Gate-to-source	±40	±40	±40	V_{dc}
V_{GB}	Gate-to-body	±40	±40	±40	V_{dc}
V_{GD}	Gate-to-drain	±40	±40	±40	V_{dc}

DC ELECTRICAL CHARACTERISTICS (T_A = 25°C, unless other specified.)

SYMBOL	PARAMETER	SD310 MIN	SD310 TYP	SD310 MAX	SD312 MIN	SD312 TYP	SD312 MAX	SD314 MIN	SD314 TYP	SD314 MAX	UNITS	TEST CONDITIONS
BREAKDOWN VOLTAGE												
BV_{DS}	Drain-to-source	30	35								V	$V_{GS} = V_{BS} = 0V$, $I_D = 10\mu A$
		10	25		10	25		20	25			$V_{GS} = V_{BS} = -5V$, $I_S = 10nA$
BV_{SD}	Source-to drain	10			10			20				$V_{GD} = V_{BD} = -5V$, $I_D = 10nA$
BV_{DB}	Drain-to-body	15			15			25				$V_{GB} = 0V$, source OPEN, $I_D = 10nA$
BV_{SB}	Source-to-body	15			15			25				$V_{GB} = 0V$, drain OPEN, $I_S = 10\mu A$
LEAKAGE CURRENT												
I_{DS} (OFF)	Drain-to-source		1	10		1	10				nA	$V_{GS} = V_{BS} = -5V$, $V_{DS} = +10V$
									1	10		$V_{GS} = V_{BS} = -5V$, $V_{DS} = +20V$
I_{SD} (OFF)	Source-to-drain		1	10		1	10					$V_{GS} = V_{BD} = -5V$, $V_{SD} = +10V$
									1	10		$V_{GS} = V_{BD} = -5V$, $V_{SD} = +20V$
I_{GBS}	Gate			0.1			0.1			0.1		$V_{DB} = V_{SB} = 0V$, $V_{GS} = ±40V$
V_T	Threshold voltage	0.5	1.0	2.0	0.5	1.0	2.0	0.5	1.0	2.0	V	$V_{DS} = V_{GS} = V_T$, $I_S = 1\mu A$, $V_{SB} = 0V$
r_{DS} (ON)	Drain-to-source resistance		30	50		30	50		30	50	Ω	$I_D = 1.0mA$, $V_{SB} = 0$, $V_{GS} = +5V$
			20	35		20	35		20	35		$I_D = 1.0mA$, $V_{SB} = 0$, $V_{GS} = +10V$
			15	25		15			15			$I_D = 1.0mA$, $V_{SB} = 0$, $V_{GS} = +15V$

AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	SD310 MIN	SD310 TYP	SD310 MAX	SD312 MIN	SD312 TYP	SD312 MAX	SD314 MIN	SD314 TYP	SD314 MAX	UNITS	TEST CONDITIONS
gfs	Forward transconductance	15	20		15	20		15	20		mmhos	$V_{DS} = 10V$, $V_{SB} = 0V$, $I_D = 20mA$, f = 1kHz
SMALL SIGNAL CAPACITANCES (See capacitance model)												
$C_{(GS+GD+GB)}$	Gate node		2.4	3.7		2.4	3.7		2.4	3.7	pF	$V_{DS} = 10V$, f = 1MHz $V_{GS} = V_{BS} = -15V$
$C_{(GD+DB)}$	Drain node		1.3	1.7		1.3	1.7		1.3	1.7		
$C_{(GS+SB)}$	Source node		3.5	4.5		3.5	4.5		3.5	4.5		
C_{DG}	Reverse transfer		0.3	0.7		0.3	0.7		0.3	0.7		

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Package Dimensions TO-72

.230
.209
(5.84)
(5.31)

.195
.178
(4.95)
(4.53)

.210
.170
(5.33)
(4.32)

.030
(.76)

4 LEADS

.500
(12.70)

.021
.016
(.53)
(.41)

.046
.036
(1.16)
(.91)

45°

.100
(2.54)

0.50
(1.27)

BOTTOM VIEW

.048
.028
(1.21)
(.72)

TO-72