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

calogic CORPORATION

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.

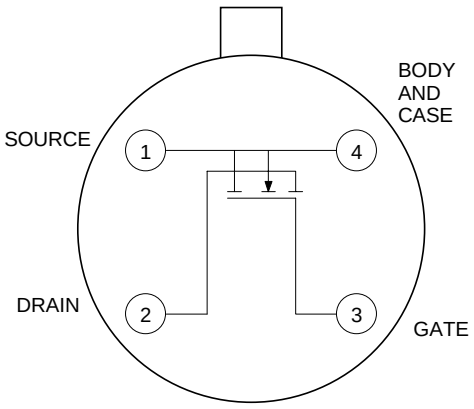
The SD314 is DMOS analog switch capable of switching ±10V analog signals with all other parameters identical to those of SD312.

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.

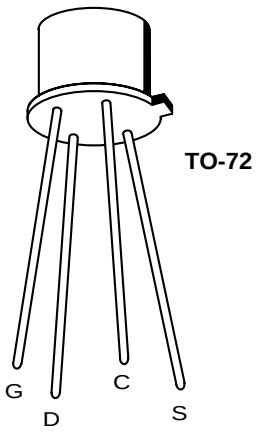
ORDERING INFORMATION

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)



Body is internally connected to the case



TO-72

CD10-2

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			SD312			SD314			UNITS	TEST CONDITIONS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
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		$V_{DB} = V_{SB} = 0V$, $V_{GS} = \pm 40V$
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			SD312			SD314			UNITS	TEST CONDITIONS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
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		

Package Dimensions TO-72