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CORPORATION

High-Speed Analog N-Channel DMOS FETs

SD210 / SD212 / SD214

FEATURES

- **High Input to Output Isolation 120dB**
- **Low On Resistance ..... 30 Ohm**
- **Low Feedthrough and Feedback Transients**
- **Low Capacitances:**
  - **—Input (Gate) ..... 2.4pF typ.**
  - **—Output ..... 1.3pF typ.**
  - **—Feedback ..... 0.3pF typ**
- **No Protecton Diode from Gate to Substrate for very high impedance applications**
- **Maximum Gate Voltage ..... ±40V**

APPLICATIONS

SD210:
- **Analog Switch Driver**

SD212 and SD214:
- **Analog Switches**
- **High-Speed Digital Switches**
- **Multiplexers**
- **A to D Converters**
- **D to A Converters**
- **Choppers**
- **Sample & Hold**

DESCRIPTION

The Calogic SD210 is a 30V analog switch driver without a built-in protection diode from gate to substrate for use with SD212 and SD214 DMOS analog switches.

The SD212 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 signal applications.

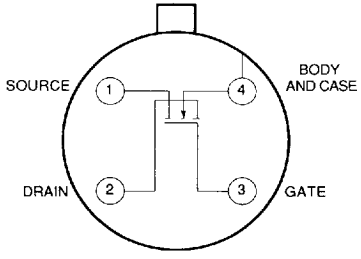
The SD214 DMOS analog switch is capable of switching ±10V analog signals with all other parameters identical to those of SD212.

All three devices are manufactured with an implanted high-speed, high-voltage, and low resistance double-diffused MOS (DMOS) process. SD210, SD212 and SD214 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 SD210, SD212 and SD214 can also be ordered.

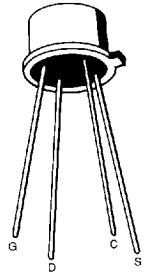
ORDERING INFORMATION

Part	Package	Temperature Range
SD210DE	Hermetic TO-72 Package	−55°C to +125°C
XSD210	Sorted Chips in Carriers	−55°C to +125°C
SD212DE	Hermetic TO-72 Package	−55°C to +125°C
XSD212	Sorted Chips in Carriers	−55°C to +125°C
SD214DE	Hermetic TO-72 Package	−55°C to +125°C
XSD214	Sorted Chips in Carriers	−55°C to +125°C

Schematic Diagram (Top View)



Body is Internally Connected to the Case



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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	SD210	SD212	SD214	UNIT
V_{DS}	Drain-to-source	+30	+10	+20	Vdc
V_{SD}	Source-to-drain*	+10	+10	+20	Vdc
V_{DB}	Drain-to-body	+30	+15	+25	Vdc
V_{SB}	Source-to-body	+15	+15	+25	Vdc
V_{GS}	Gate-to-source	±40	±40	±40	Vdc
V_{GB}	Gate-to-body	±40	±40	±40	Vdc
V_{GD}	Gate-to-drain	±40	±40	±40	Vdc

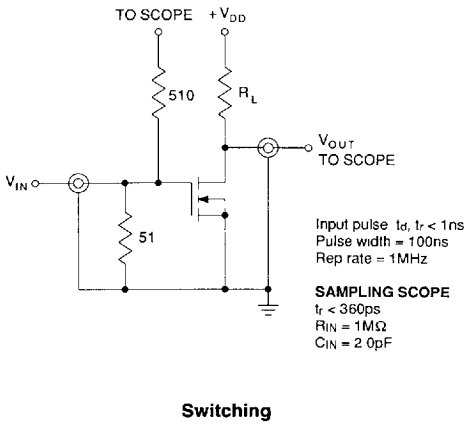
DC ELECTRICAL CHARACTERISTICS ($T_A = 25°C$, unless otherwise specified.)

PARAMETER		TEST CONDITIONS	SD210 MIN.	SD210 TYP.	SD210 MAX.	SD212 MIN.	SD212 TYP.	SD212 MAX.	SD214 MIN.	SD214 TYP.	SD214 MAX.	UNIT
Breakdown voltage												
BV_{DS}	Drain-to-source	$V_{GS} = V_{BS} = 0V$, $I_D = 10\mu A$	30	35								V
		$V_{GS} = V_{BS} = -5V$, $I_S = 10nA$	10	25		10	25		20	25		V
BV_{SD}	Source-to-drain	$V_{GD} = V_{BD} = -5V$, $I_D = 10nA$	10			10			20			V
BV_{DB}	Drain-to body	$V_{GB} = 0V$, source OPEN, $I_D = 10nA$	15			15			25			V
BV_{SB}	Source-to body	$V_{GB} = 0V$, drain OPEN, $I_S = 10\mu A$	15			15			25			V
Leakage current												
I_{DS} (OFF)	Drain-to-source	$V_{GS} = V_{BS} = -5V$										
		$V_{DS} = +10V$		1	10		1	10				nA
		$V_{DS} = +20V$								1	10	nA
I_{SD} (OFF)	Source-to-drain	$V_{GS} = V_{BD} = -5V$										
		$V_{SD} = +10V$		1	10		1	10				nA
		$V_{SD} = +20V$								1	10	nA
I_{GBS}	Gate	$V_{DB} = V_{SB} = 0V$, $V_{GS} = \pm 40V$			0.1			0.1			0.1	nA
V_T	Threshold voltage	$V_{DS} = V_{GS} = V_T$, $I_S = 1\mu A$, $V_{SB} = 0V$	0.5	1.0	2.0	0.1	1.0	2.0	0.1	1.0	2.0	V
r_{DS} (ON)	Drain-to-source resistance	$I_D = 1.0mA$, $V_{SB} = 0$										
		$V_{GS} = +5V$		50	70		50	70		50	70	Ω
		$V_{GS} = +10V$		30	45		30	45		30	45	Ω
		$V_{GS} = +15V$		23			23			23		Ω
		$V_{GS} = +20V$		19			19			19		Ω
		$V_{GS} = +25V$		17			17			17		Ω

AC ELECTRICAL CHARACTERISTICS

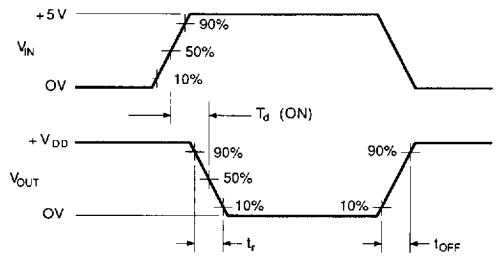
PARAMETER		TEST CONDITIONS	SD210 MIN.	SD210 TYP.	SD210 MAX.	SD212 MIN.	SD212 TYP.	SD212 MAX.	SD214 MIN.	SD214 TYP.	SD214 MAX.	UNIT
gfs	Forward transconductance	$V_{DS} = 10V$, $V_{SB} = 0V$, $I_D = 20mA$, f = 1kHz	10	15		10	15		10	15		mS
Small Signal Capacitances (See capacitance model)		$V_{DS} = 10V$, f = 1MHz										
$C_{(GS+GD+GB)}$	Gate Node	$V_{GS} = V_{BS} = -15V$		2.4	3.5		2.4	3.5		2.4	3.5	pF
$C_{(GD+DB)}$	Drain node			1.3	1.5		1.3	1.5		1.3	1.5	pF
$C_{(GS+SB)}$	Source node			3.5	5.5		3.5	5.5		3.5	5.5	pF
C_{DG}	Reverse transfer			0.3	0.5		0.3	0.5		0.3	0.5	pF

Test Conditions



Switching

Typical Waveforms

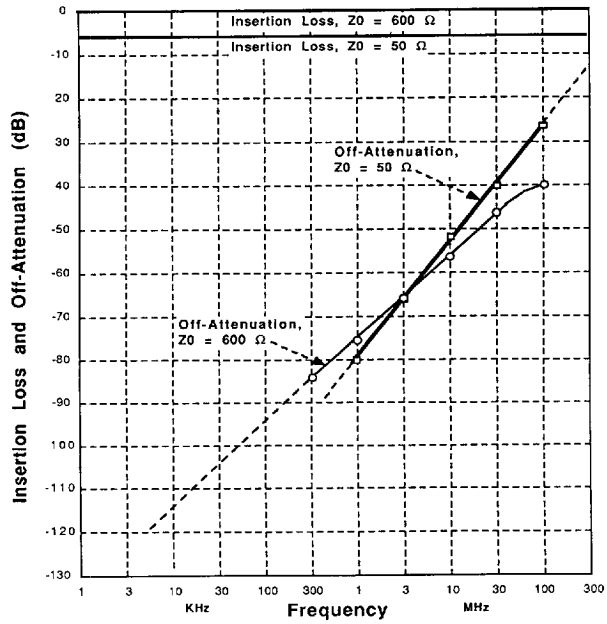


SWITCHING CHARACTERISTICS

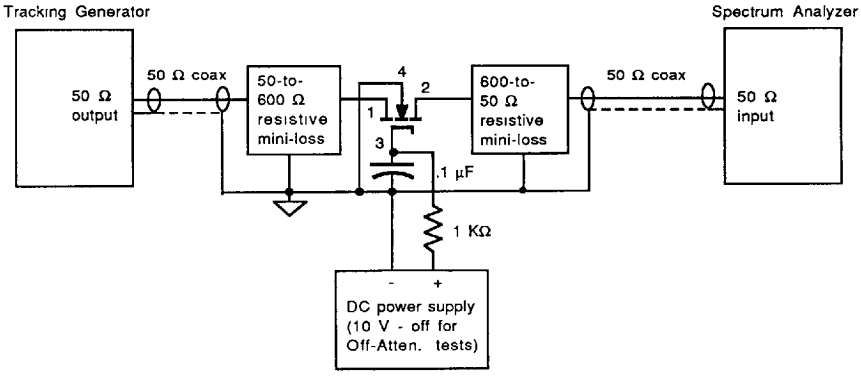
V_{DD}		t_d (ON) (ns)		t_r (ns)		t_{OFF} (ns)*		UNITS
		TYP.	MAX.	TYP.	MAX.	TY.	MAX.	
5	680	0.6	1 0	0 7	1 0	9.0		nsec
10	680	0 7		0 8		9 0		nsec
15	1k	0 9		1 0		14 0		nsec

*t_{OFF} is dependent on R_L and C_L and does not depend on the device characteristics

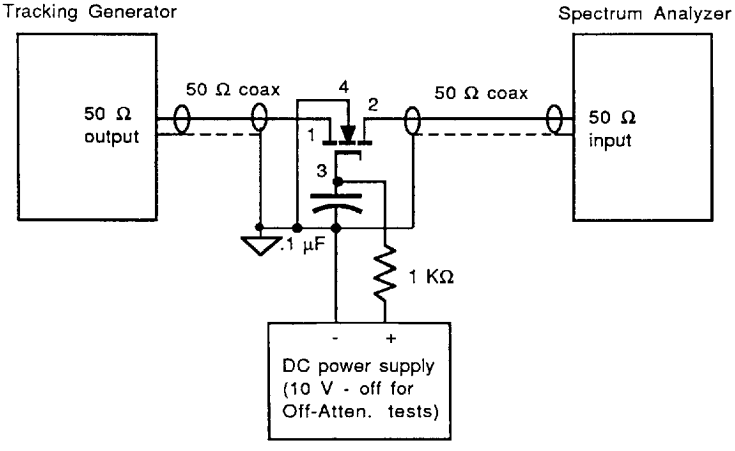
Insertion Loss and Off-Attenuation vs. Frequency



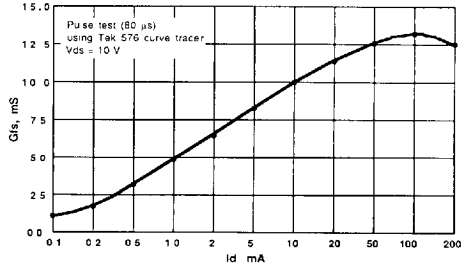
600Ω Insertion Loss and Off-Attenuation Fixture Schematic (un-shielded leads near device under test are extremely short)



50Ω Insertion Loss and Off-Attentuation Fixture Schematic (un-shielded leads near device under test are extremely short)



Forward Transconductance vs. Drain Current



Drain-Source DC On-Resistance vs. Gate-to-Source Voltage