

High-Speed Analog N-Channel DMOS FETs



SD211 / SD213 / SD215

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
- Built-in Protection Diode from Gate to Substrate

APPLICATIONS

SD211:

- Analog Switch Driver

SD213 and SD215:

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

DESCRIPTION

The Calogic SD211 is a 30V analog switch driver with a built-in protection diode from gate to substrate. The SD211 is used with SD213 and SD215 DMOS analog switches.

The SD213 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 signal applications.

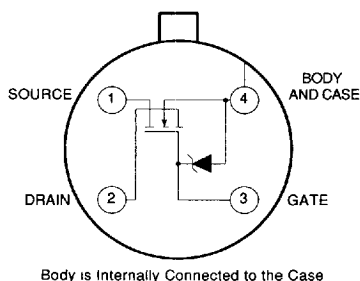
The SD215 DMOS analog switch is capable of switching $\pm 10V$ analog signals with all other parameters identical to those of SD213.

All three devices are manufactured with an implanted high-speed, high-voltage, and low resistance double-diffused MOS (DMOS) process. SD213 and SD215 devices also have a built-in protection diode. The devices are available in 4-lead hermetic TO-72 packages and in die form for hybrid applications. Custom devices based on SD211, SD213 and SD215 can also be ordered.

ORDERING INFORMATION

Part	Package	Temperature Range
SD211DE	Hermetic TO-72 Package	-55°C to +125°C
XSD211	Sorted Chips in Carriers	-55°C to +125°C
SD213DE	Hermetic TO-72 Package	-55°C to +125°C
XSD213	Sorted Chips in Carriers	-55°C to +125°C
SD215DE	Hermetic TO-72 Package	-55°C to +125°C
XSD215	Sorted Chips in Carriers	-55°C to +125°C

Schematic Diagram (Top View)



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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	SD211	SD213	SD215	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	-15 +25	-15 +25	-25 +30	V _{dc}
V _{GB} Gate-to-body	-0.3 +25	-0.3 +25	-0.3 +30	V _{dc}
V _{GD} Gate-to-drain	-30 +25	-15 +25	-25 +30	V _{dc}

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

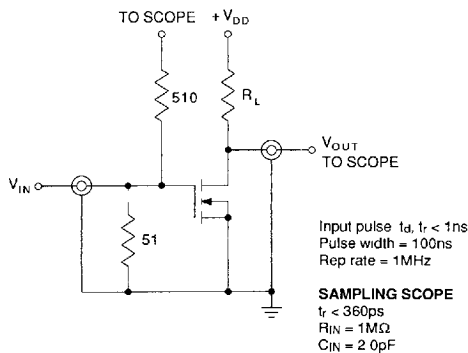
PARAMETER	TEST CONDITIONS	SD211			SD213			SD215			UNIT
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Breakdown voltage											
BV _{DS} Drain-to-source	V _{GS} = V _{BS} = 0V, I _D = 10μA V _{GS} = V _{BS} = -5V, I _S = 10nA	30	35		10	25		20	25		V
		10	25								V
BV _{SD} Source-to-drain	V _{GD} = 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 = 10μA	15			15			25			V
Leakage current											
I _{DS} (OFF) Drain-to-source	V _{GS} = V _{BS} = -5V V _{DS} = +10V V _{DS} = +20V		1	10		1	10		1	10	nA
											nA
I _{SD} (OFF) Source-to-drain	V _{GS} = V _{BD} = -5V V _{SD} = +10V V _{SD} = +20V		1	10		1	10		1	10	nA
											nA
I _{GBS} Gate	V _{DB} = V _{SB} = 0V, V _{GS} = +30V -0.3V		10			10			10		μA
V _T Threshold voltage	V _{DS} = V _{GS} = V _T , I _S = 1μA, 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 V _{GS} = +10V V _{GS} = +15V V _{GS} = +20V V _{GS} +25V		50	70		50	70		50	70	Ω
			30	45		30	45		30	45	Ω
			23			23			23		Ω
			19			19			19		Ω
									17		Ω

AC ELECTRICAL CHARACTERISTICS

PARAMETER	TEST CONDITIONS	SD211			SD213			SD215			UNIT
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
g _{fs} 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 V _{GS} = V _{BS} = -15V										
C _{iss}			2.4	3.5		2.4	2.5		2.4	3.5	pF
C _{oss}			1.3	1.5		1.3	1.5		1.3	1.5	pF
C _{rss}			0.3	0.5		0.3	0.5		0.3	0.5	pF

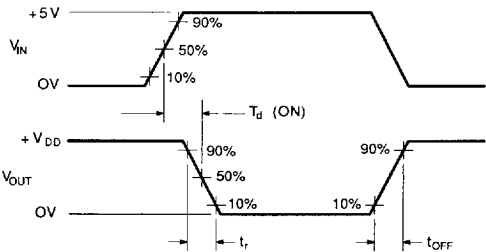
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Test Conditions



Switching

Typical Waveforms



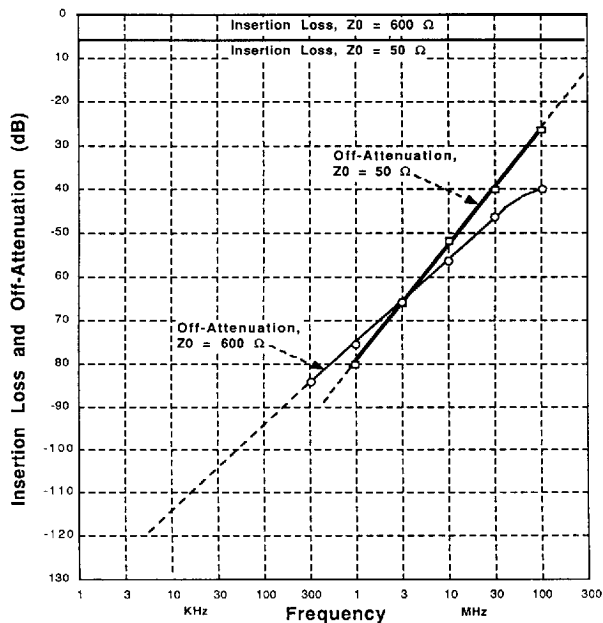
SWITCHING CHARACTERISTICS

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

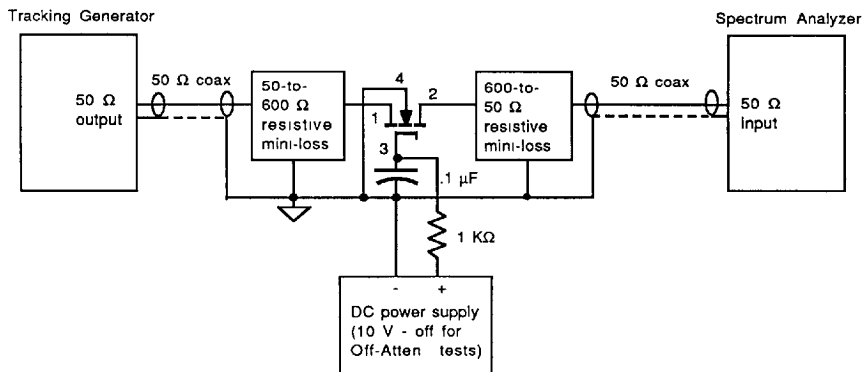
*t_{OFF} is dependent on R_L and C_L and does not depend on the device characteristics

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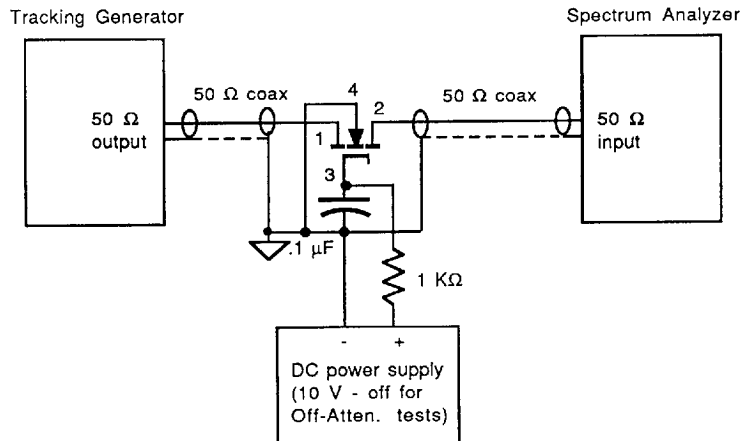
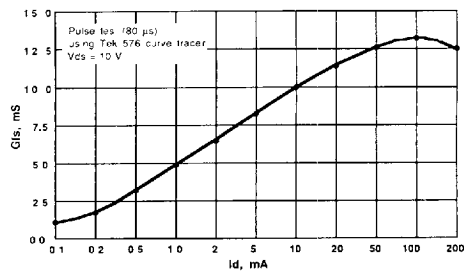
Insertion Loss and Off-Attenuation vs. Frequency



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



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50 Ω Insertion Loss and Off-Attenuation 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
