

High-Speed DMOS Quad FET Analog Switch Arrays



SD5000 / SD5001 / SD5002

FEATURES:

- Low Propagation Time 600 psec
- Low On Resistance
- Low Insertion Loss
- Low Capacitances: Analog Input 3.5pF typ.
Input (Gate) 2.4pF typ.
Output 1.3pF typ.
Feedback 0.3pF typ.
- Low Crosstalk -107dB typ. @ 3kHz
- Bidirectional Operation

APPLICATIONS:

- Analog Switching
- Audio Routing
- Sample & Hold
- Crosspoint Switches
- Choppers
- Video Switching

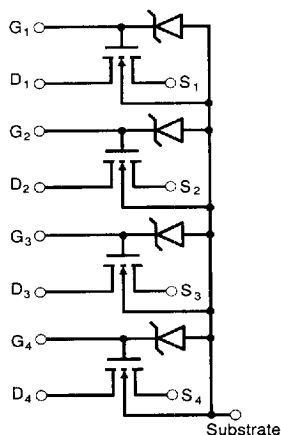
DESCRIPTION:

The SD5000 Series, consisting of SD5000, SD5001 and SD5002 are monolithic arrays of four bidirectional, high performance analog switches manufactured with implanted, high-speed, high-voltage and low resistance double-diffused MOS (DMOS) process. The maximum threshold of 2V permits simple direct TTL and CMOS driving in small signal applications. The SD5000 was designed to handle $\pm 10V$ analog input signals. The SD5001 was designed to handle $\pm 5V$ analog input signals. The SD5002 was designed to handle $\pm 7.5V$ analog input signals. The devices are available in 16-pin plastic DIP package and in die form for hybrid applications. Custom devices based on SD5000 Series can also be ordered.

ORDERING INFORMATION

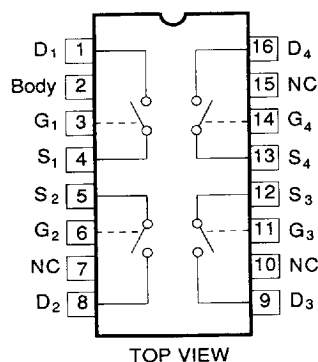
Part	Package	Temperature Range
SD5000N	Plastic DIP Package	-55°C to +150°C
SD5001N	Plastic DIP Package	-55°C to +150°C
SD5002N	Plastic DIP Package	-55°C to +150°C
XSD5000	Sorted Chips in Carriers	-55°C to +150°C
XSD5001	Sorted Chips in Carriers	-55°C to +150°C
XSD5002	Sorted Chips in Carriers	-55°C to +150°C

Functional Block Diagram



CD2

Dual In Line Package



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DC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	SD5000			SD5001			SD5002			UNITS	CONDITIONS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Analog Signal Range	V_{analog}	-10		+10	-5		+5	-7.5		+7.5	V	
Breakdown Voltage												
Drain-Source	BV_{DS}	20	25		10	25		15	25		V	$V_{GS} = V_{BS} = -5V, I_D = 10nA$
Source-Drain	BV_{SD}	20			10			15			V	$V_{GD} = V_{BD} = -5V, I_S = 10nA$
Drain-body	BV_{DB}	25			15			22.5			V	$V_{GB} = 0V, I_D = 10nA$ Source Open
Source-body	BV_{SB}	25			15			22.5			V	$V_{GB} = 0V, I_S = 10\mu A$, Drain Open
Leakage Current—SD5000												
Drain-Source	$I_{DS(off)}$		1.0	10.0							nA	$V_{GS} = V_{BS} = -5V, V_{DS} = 20V$
Source-Drain	$I_{SD(off)}$		1.0	10.0							nA	$V_{GD} = V_{BD} = -5V, V_{SD} = 20V$
Gate	I_{GBS}			1.0							μA	$V_{DB} = V_{SB} = 0V, V_{GB} = 30V$
Leakage Current—SD5001												
Drain-Source	$I_{DS(off)}$				1.0	10.0					nA	$V_{GS} = V_{BS} = -5V, V_{DS} = 10V$
Source-Drain	$I_{SD(off)}$				1.0	10.0					nA	$V_{GD} = V_{BD} = -5V, V_{SD} = 10V$
Gate	I_{GBS}					1.0					μA	$V_{DB} = V_{SB} = 0V, V_{GB} = 25V$
Leakage Current—SD5002												
Drain-Source	$I_{DS(off)}$							1.0	10.0		nA	$V_{GS} = V_{BS} = -5V, V_{DS} = 15V$
Source-Drain	$I_{SD(off)}$							1.0	10.0		nA	$V_{GD} = V_{BD} = -5V, V_{SD} = 15V$
Gate	I_{GBS}								1.0		μA	$V_{DB} = V_{SB} = 0V, V_{GB} = 30V$
Threshold Voltage	V_T	0.1	1.0	2.0	0.1	1.0	2.0	0.1	1.0	2.0	V	$V_{DS} = V_{GS} = V_T, V_{SB} = 0V, I_D = 1\mu A$
Drain-Source ON Resistance	$R_{DS(on)}$	50		70	50		70	50		70	Ω	$V_{GS} = 5V$
		30			30			30			Ω	$V_{GS} = 10V$
		23			23			19			Ω	$V_{GS} = 15V$
		19			19			19			Ω	$V_{GS} = 20V$
Match ON Resistance	$R_{DS(on)}$		1	5		1	5		1	5	Ω	$V_{GS} = 5V$

AC ELECTRICAL CHARACTERISTICS (Common to SD5000, SD5001 & SD5002) $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Forward Transconductance	g_{fs}	10	12		mS	$V_{DS} = 10V, I_D = 20mA$ $V_{SB} = 0V, f = 1kHz$
Capacitances						
Gate Node	C_G		2.4	3.5	pF	} $V_{DS} = 10V, f = 1MHz$ $V_{GS} = V_{BS} = -15V$
Drain Node	C_D		1.3	1.5	pF	
Source Node	C_S		3.5	4.0	pF	
Reverse Transfer	C_{DG}		0.3	0.5	pF	
Crosstalk	C_T		-107.0		dB	$f = 3kHz, R_G = 600\Omega$

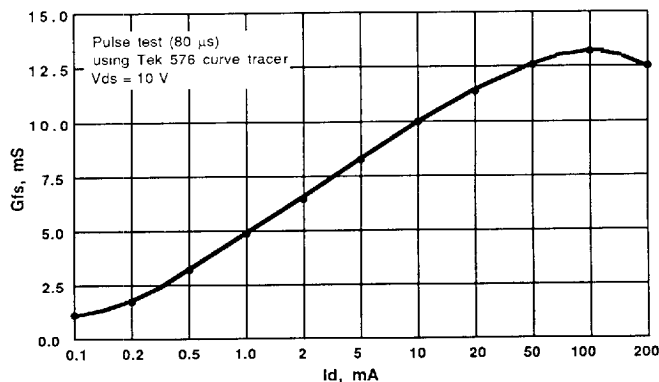
SWITCHING CHARACTERISTICS (Common to SD5000, SD5001 & SD5002) $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	CONDITONS
Turn-on Time	$t_{d(on)}$		0.7	1.0	nsec	} $R_L = 680\Omega, R_G = 51$ $V_{DD} = 5V$ $V_{G(on)} = 10V$
Rise Time	t_r		0.8	1.0	nsec	
Turn-off Time	t_{off}^*		10.0		nsec	

* t_{off} is dependent on R_L and C and does not depend on the device characteristics

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Forward Transconductance vs. Drain Current



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	SD5000 MAX. VALUE	SD5001 MAX. VALUE	SD5002 MAX. VALUE	UNITS
Breakdown Voltage					
Drain-Source	V_{DS}	20	10	15	V
Source-Drain	V_{SD}	20	10	15	V
Drain-body	V_{DB}	25	15	22.5	V
Source-body	V_{SB}	25	15	22.5	V
Gate-Source	V_{GS}	30 / - 25	25 / - 15	30 / - 22.5	V
Gate-body	V_{GB}	30 / - 0.3	25 / - 0.3	30 / - 0.3	V
Gate-Drain	V_{GD}	30 / - 25	30 / - 15	30 / - 22.5	V

ABSOLUTE MAXIMUM

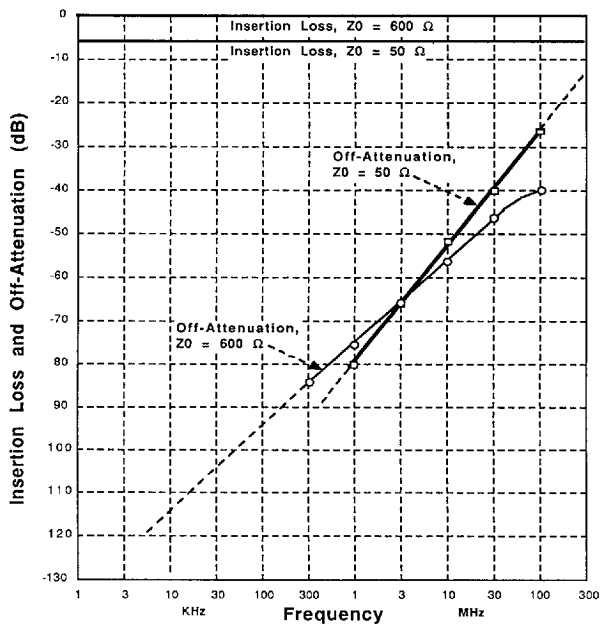
Common to SD5000, SD5001 & SD5002

PARAMETER	SYMBOL	VALUE	UNIT
Drain Current	I_D	50	mA
Temperature Range			
Operating	T_J	- 55 to + 85	$^{\circ}$ C
Storage	T_S	- 55 to + 150	$^{\circ}$ C
Power Dissipation			
Package	P_D	640 (Note 1)	mW
Each Device	P_D	300 (Note 2)	mW

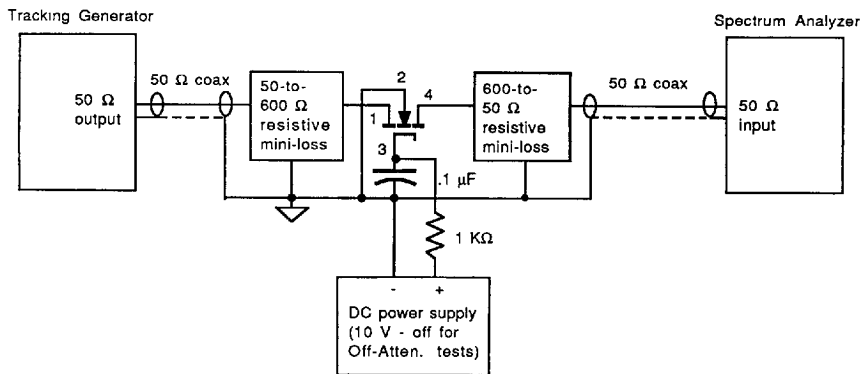
Note 1: Linear Derating Factor — 10 mW/ $^{\circ}$ C above 25 $^{\circ}$ CNote 2: Linear Derating Factor — 50 mW/ $^{\circ}$ C above 25 $^{\circ}$ C

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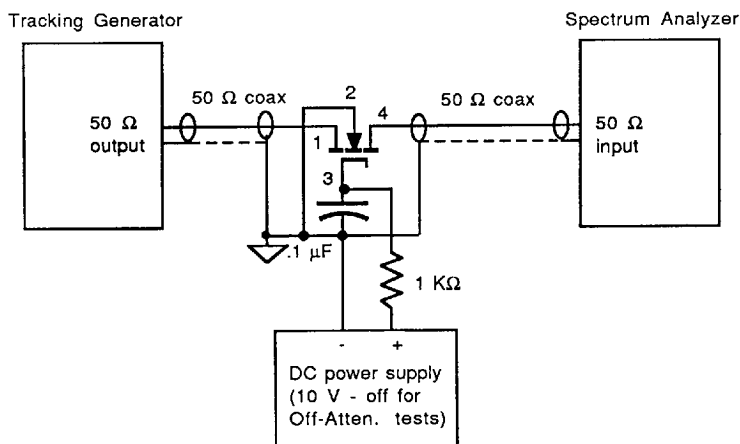
Insertion Loss and Off-Attenuation vs. Frequency



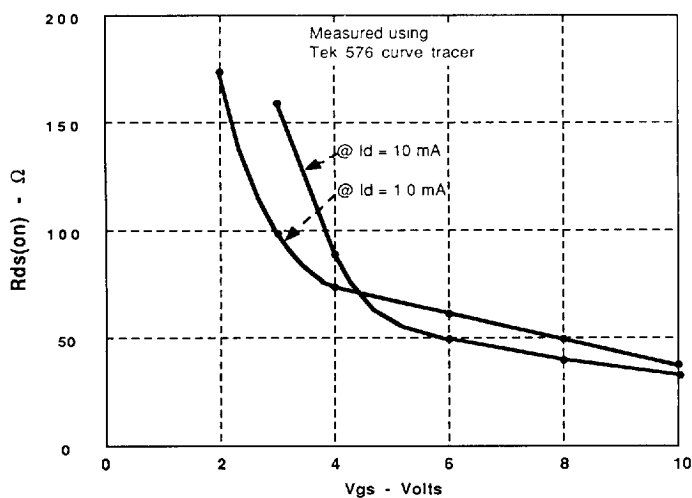
600 Ω Insertion Loss and Off-Attenuation Fixture Schematic (un-shielded leads near device under test are extremely short)



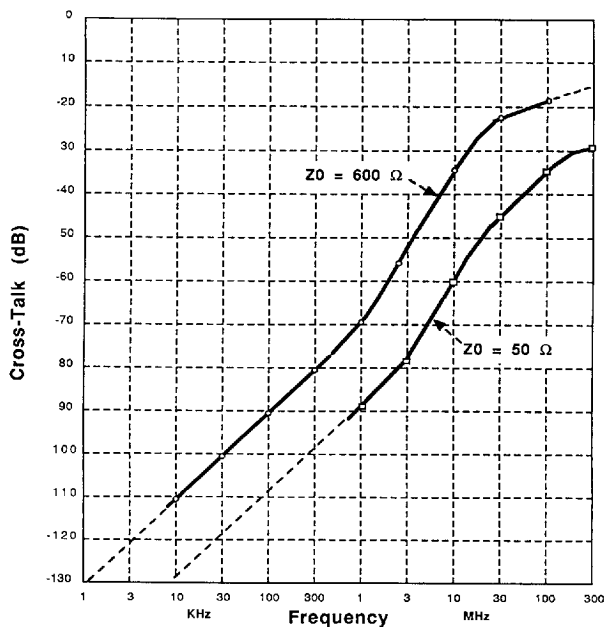
50 Ω Insertion Loss and Off-Attenuation Fixture Schematic (un-shielded leads near device under test are extremely short)



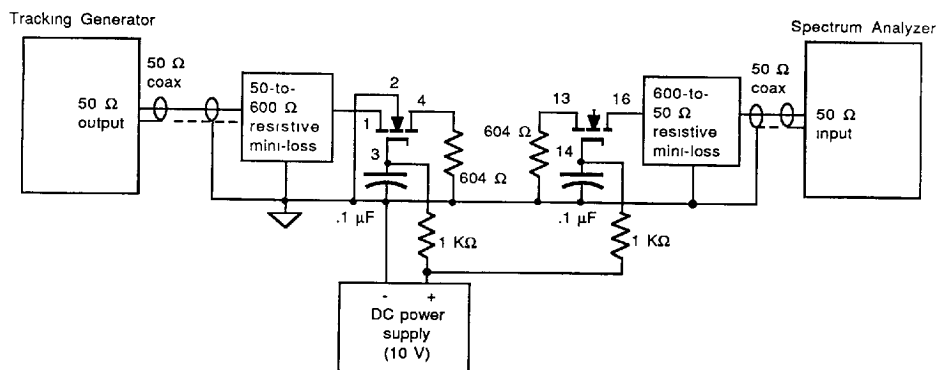
Drain-Source DC On-Resistance vs. Gate-to-Source Voltage

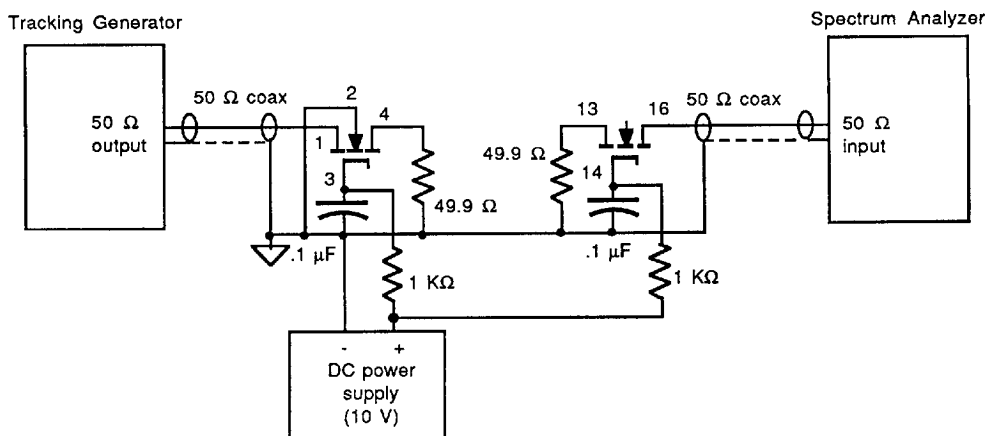


Cross-Talk vs. Frequency

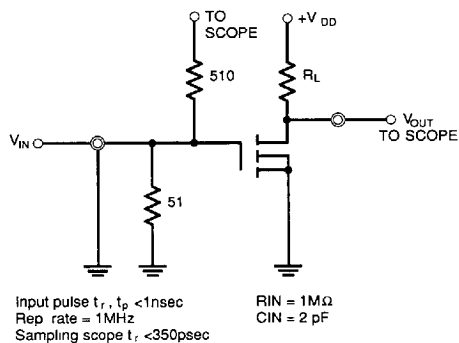


600Ω Cross-Talk Fixture Schematic



50 Ω Cross-Talk Fixture Schematic

Test Circuit



Switching Waveform

