ANALOG DEVICES

CMOS 1.8 V to 5.5 V, 2.5 Ω SPDT Switch/2:1 Mux in Tiny SC70 Package

ADG779

FEATURES

1.8 V to 5.5 V single supply
2.5 Ω on resistance
0.75 Ω on-resistance flatness
−3 dB bandwidth >200 MHz
Rail-to-rail operation
6-lead SC70 package
Fast switching times
    t_{ON} 20 ns
    t_{OFF} 6 ns
Typical power consumption (<0.01 μW)
TTL/CMOS compatible

APPLICATIONS

Battery-powered systems
Communication systems
Sample hold systems
Audio signal routing
Video switching
Mechanical reed relay replacements

GENERAL DESCRIPTION

The ADG779 is a monolithic CMOS SPDT (single-pole, double-throw) switch. This switch is designed on a submicron process that provides low power dissipation yet gives high switching speed, low on resistance, and low leakage currents.

The ADG779 operates from a single supply range of 1.8 V to 5.5 V, making it ideal for use in battery-powered instruments and with the new generation of DACs and ADCs from Analog Devices, Inc.

Each switch of the ADG779 conducts equally well in both directions when on. The ADG779 exhibits break-before-make switching action.

Because of the advanced submicron process, −3 dB bandwidth of greater than 200 MHz can be achieved.

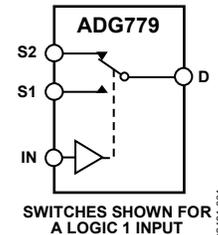The ADG779 is available in a 6-lead SC70 package.

FUNCTIONAL BLOCK DIAGRAM

SWITCHES SHOWN FOR
A LOGIC 1 INPUT

Figure 1.

PRODUCT HIGHLIGHTS

1. Tiny 6-Lead SC70 Package.

2. 1.8 V to 5.5 V Single-Supply Operation. The ADG779 offers high performance, including low on resistance and fast switching times, and is fully specified and guaranteed with 3 V and 5 V supply rails.

3. Very Low R_{ON} (5 Ω max at 5 V, 10 Ω max at 3 V). At 1.8 V operation, R_{ON} is typically 40 Ω over the temperature range.

4. On-Resistance Flatness ($R_{FLAT\,(ON)}$) (0.75 Ω typ).

5. −3 dB Bandwidth > 200 MHz.

6. Low Power Dissipation. CMOS construction ensures low power dissipation.

7. 14 ns Switching Times.

ADG779

TABLE OF CONTENTS

REVISION HISTORY

10/05—Rev. 0 to Rev. A

7/01—Revision 0: Initial Version

SPECIFICATIONS

$V_{DD} = 5 V \pm 10\%$, GND = 0 V [1]

Table 1.

Parameter	B Version 25°C	B Version −40°C to +85°C	Unit	Test Conditions/Comments
ANALOG SWITCH				
Analog Signal Range		0 V to V_{DD}	V	
On Resistance (R_{ON})	2.5		Ω typ	V_S = 0 V to V_{DD}, I_S = −10 mA, see Figure 12
	5	6	Ω max	
On-Resistance Match Between Channels (ΔR_{ON})	0.1		Ω typ	V_S = 0 V to V_{DD}, I_S = −10 mA
		0.8	Ω max	
On-Resistance Flatness ($R_{FLAT (ON)}$)	0.75		Ω typ	V_S = 0 V to V_{DD}, I_S = −10 mA
		1.2	Ω max	
LEAKAGE CURRENTS [2]				V_{DD} = 5.5 V
Source Off Leakage I_S (Off)	±0.01	±0.05	nA typ	V_S = 4.5 V/1 V, V_D = 1 V/4.5 V, see Figure 13
Channel On Leakage I_D, I_S (On)	±0.01	±0.05	nA typ	$V_S = V_D$ = 1 V, or $V_S = V_D$ = 4.5 V, see Figure 14
DIGITAL INPUTS				
Input High Voltage, V_{INH}		2.4	V min	
Input Low Voltage, V_{INL}		0.8	V max	
Input Current				
I_{INL} or I_{INH}	0.005		µA typ	$V_{IN} = V_{INL}$ or V_{INH}
		±0.1	µA max	
DYNAMIC CHARACTERISTICS [2]				
t_{ON}	14		ns typ	R_L = 300 Ω, C_L = 35 pF
		20	ns max	V_S = 3 V, see Figure 15
t_{OFF}	3		ns typ	R_L = 300 Ω, C_L = 35 pF
		6	ns max	V_S = 3 V, see Figure 15
Break-Before-Make Time Delay, t_D	8		ns typ	R_L = 300 Ω, C_L = 35 pF
		1	ns min	$V_{S1} = V_{S2}$ = 3 V, see Figure 16
Off Isolation	−67		dB typ	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz
	−87		dB typ	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz, see Figure 17
Channel-to-Channel Crosstalk	−62		dB typ	R_L = 50 Ω, C_L = 5 pF, f = 10 MHz
	−82		dB typ	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz, see Figure 18
Bandwidth −3 dB	200		MHz typ	R_L = 50 Ω, C_L = 5 pF, see Figure 19
C_S (Off)	7		pF typ	f = 1 MHz
C_D, C_S (On)	27		pF typ	f = 1 MHz
POWER REQUIREMENTS				V_{DD} = 5.5 V
				Digital Inputs = 0 V or 5 V
I_{DD}	0.001		µA typ	
		1.0	µA max	

[1] Temperature range is B Version, −40°C to +85°C.
[2] Guaranteed by design, not subject to production test.

ADG779

$V_{DD} = 3\ V \pm 10\%$, GND = 0 V [1]

Table 2.

Parameter	B Version 25°C	B Version −40°C to +85°C	Unit	Test Conditions/Comments
ANALOG SWITCH				
Analog Signal Range		0 V to V_{DD}	V	
On Resistance (R_{ON})	6	7	Ω typ	$V_S = 0\ V$ to V_{DD}, $I_S = -10\ mA$, see Figure 12
		10	Ω max	
On-Resistance Match Between Channels (ΔR_{ON})	0.1		Ω typ	$V_S = 0\ V$ to V_{DD}, $I_S = -10\ mA$
		0.8	Ω max	
On-Resistance Flatness ($R_{FLAT\,(ON)}$)	2.5		Ω typ	$V_S = 0\ V$ to V_{DD}, $I_S = -10\ mA$
LEAKAGE CURRENTS [2]				$V_{DD} = 3.3\ V$
Source Off Leakage I_S (Off)	±0.01	±0.05	nA typ	$V_S = 3\ V/1\ V$, $V_D = 1\ V/3\ V$, see Figure 13
Channel On Leakage I_D, I_S (On)	±0.01	±0.05	nA typ	$V_S = V_D = 1\ V$, or $V_S = V_D = 3\ V$, see Figure 14
DIGITAL INPUTS				
Input High Voltage, V_{INH}		2.0	V min	
Input Low Voltage, V_{INL}		0.8	V max	
Input Current				
I_{INL} or I_{INH}	0.005		µA typ	$V_{IN} = V_{INL}$ or V_{INH}
		±0.1	µA max	
DYNAMIC CHARACTERISTICS [2]				
t_{ON}	16		ns typ	$R_L = 300\ \Omega$, $C_L = 35\ pF$
		24	ns max	$V_S = 2\ V$, see Figure 15
t_{OFF}	4		ns typ	$R_L = 300\ \Omega$, $C_L = 35\ pF$
		7	ns max	$V_S = 2\ V$, see Figure 15
Break-Before-Make Time Delay, t_D	8		ns typ	$R_L = 300\ \Omega$, $C_L = 35\ pF$
		1	ns min	$V_{S1} = V_{S2} = 2\ V$, see Figure 16
Off Isolation	−67		dB typ	$R_L = 50\ \Omega$, $C_L = 5\ pF$, $f = 10\ MHz$
	−87		dB typ	$R_L = 50\ \Omega$, $C_L = 5\ pF$, $f = 1\ MHz$, see Figure 17
Channel-to-Channel Crosstalk	−62		dB typ	$R_L = 50\ \Omega$, $C_L = 5\ pF$, $f = 10\ MHz$
	−82		dB typ	$R_L = 50\ \Omega$, $C_L = 5\ pF$, $f = 1\ MHz$, see Figure 18
Bandwidth −3 dB	200		MHz typ	$R_L = 50\ \Omega$, $C_L = 5\ pF$, see Figure 19
C_S (Off)	7		pF typ	$f = 1\ MHz$
C_D, C_S (On)	27		pF typ	$f = 1\ MHz$
POWER REQUIREMENTS				$V_{DD} = 3.3\ V$ Digital Inputs = 0 V or 3 V
I_{DD}	0.001		µA typ	
		1.0	µA max	

[1] Temperature range is B Version, −40°C to +85°C.
[2] Guaranteed by design, not subject to production test.

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted.

Table 3.

Parameter	Rating
V_{DD} to GND	−0.3 V to +7 V
Analog, Digital Inputs[1]	−0.3 V to V_{DD} + 0.3 V or 30 mA, whichever occurs first
Peak Current, S or D	100 mA (pulsed at 1 ms, 10% duty cycle max)
Continuous Current, S or D	30 mA
Operating Temperature Range	
Industrial (B Version)	−40°C to +85°C
Storage Temperature Range	−65°C to +150°C
Junction Temperature	150°C
SC70 Package, Power Dissipation	315 mW
θ_{JA} Thermal Impedance	332°C/W
θ_{JC} Thermal Impedance	120°C/W
Lead Temperature, Soldering	
Vapor Phase (60 sec)	215°C
Infrared (15 sec)	220°C
Reflow Soldering (Pb-free)	
Peak Temperature	260 (+0/−5)°C
Time at Peak Temperature	10 sec to 40 sec

[1] Overvoltages at IN, S, or D are clamped by internal diodes. Current should be limited to the maximum ratings given.

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Table 4. Truth Table

ADG779 IN	Switch S1	Switch S2
0	On	Off
1	Off	On

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

WARNING!
ESD SENSITIVE DEVICE

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS
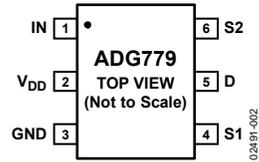
Figure 2. Pin Configuration

Table 5. Pin Function Descriptions

Pin No.	Mnemonic	Description
1	IN	Logic Control Input.
2	V_{DD}	Most Positive Power Supply Potential.
3	GND	Ground (0 V) Reference.
4	S1	Source Terminal. Can be an input or an output.
5	D	Drain Terminal. Can be an input or an output.
6	S2	Source Terminal. Can be an input or an output.

TERMINOLOGY

V_{DD}
Most positive power supply potential.

I_{DD}
Positive supply current.

GND
Ground (0 V) reference.

S
Source terminal. Can be an input or an output.

D
Drain terminal. Can be an input or an output.

IN
Logic control input.

V_D (V_S)
Analog voltage on drain (D) and source (S) terminals.

R_{ON}
Ohmic resistance between the D and S.

$R_{FLAT\ (ON)}$
Flatness is defined as the difference between the maximum and minimum value of on resistance as measured.

ΔR_{ON}
On-resistance mismatch between any two channels.

I_S (Off)
Source leakage current with the switch off.

I_D (Off)
Drain leakage current with the switch off.

I_D, I_S (On)
Channel leakage current with the switch on.

V_{INL}
Maximum input voltage for Logic 0.

V_{INH}
Minimum input voltage for Logic 1.

I_{INL} (I_{INH})
Input current of the digital input.

C_S (Off)
Off switch source capacitance. Measured with reference to ground.

C_D (Off)
Off switch drain capacitance. Measured with reference to ground.

C_D, C_S (On)
On switch capacitance. Measured with reference to ground.

C_{IN}
Digital input capacitance.

t_{ON}
Delay time between the 50% and 90% points of the digital input and switch on condition.

t_{OFF}
Delay time between the 50% and 90% points of the digital input and switch off condition.

t_{BBM}
On or off time measured between the 80% points of both switches when switching from one to another.

Charge Injection
A measure of the glitch impulse transferred from the digital input to the analog output during on/off switching.

Off Isolation
A measure of unwanted signal coupling through an off switch.

Crosstalk
A measure of unwanted signal that is coupled through from one channel to another because of parasitic capacitance.

−3 dB Bandwidth
The frequency at which the output is attenuated by 3 dB.

On Response
The frequency response of the on switch.

Insertion Loss
The loss due to the on resistance of the switch.

THD + N
The ratio of harmonic amplitudes plus noise of a signal to the fundamental.
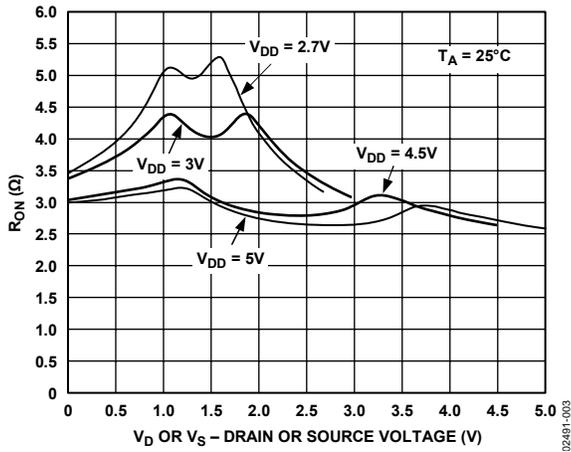
TYPICAL PERFORMANCE CHARACTERISTICS

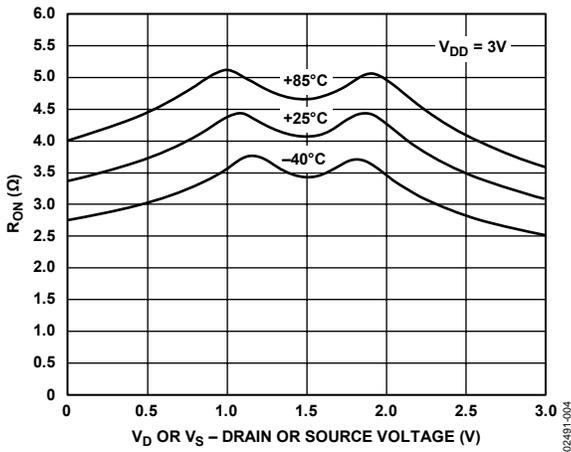Figure 3. On Resistance as a Function of V_D (V_S) Single Supplies

Figure 4. On Resistance as a Function of V_D (V_S) for Different Temperatures V_{DD} = 3 V
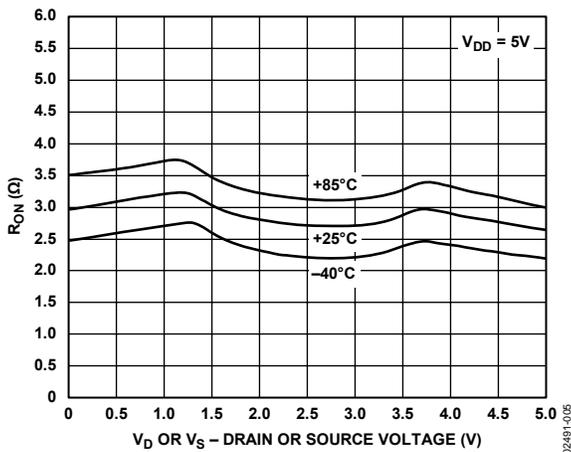

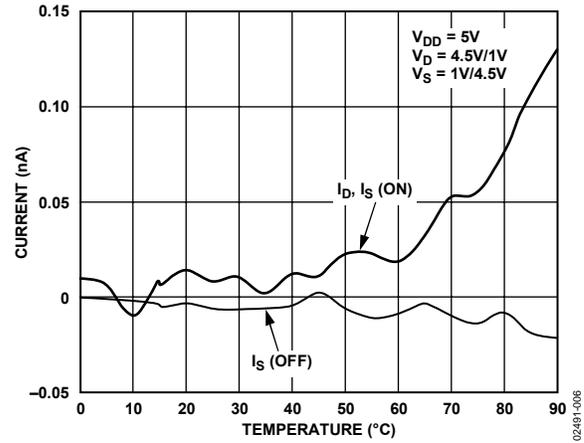Figure 5. On Resistance as a Function of V_D (V_S) for Different Temperatures V_{DD} = 5 V

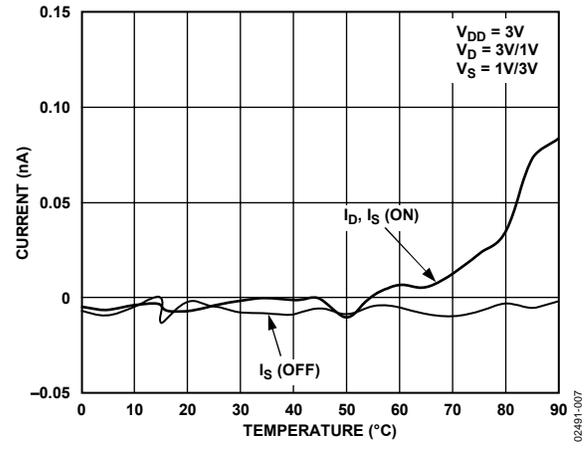Figure 6. Leakage Currents as a Function of Temperature

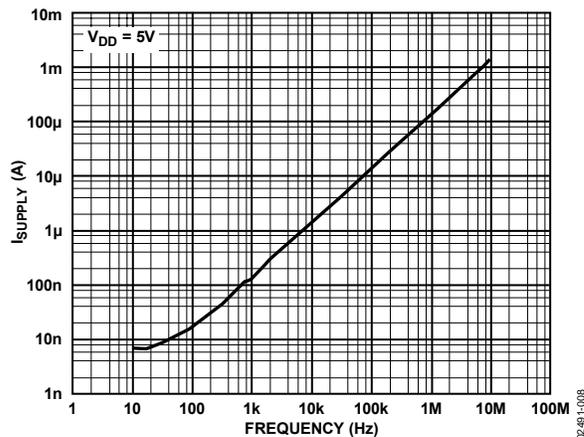Figure 7. Leakage Currents as a Function of Temperature
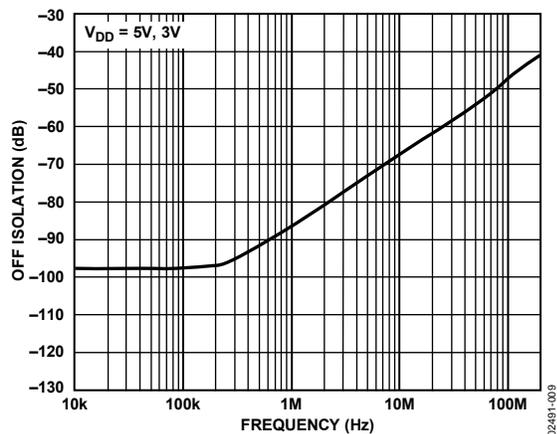

Figure 8. Supply Current vs. Input Switching Frequency

Figure 9. Off Isolation vs. Frequency
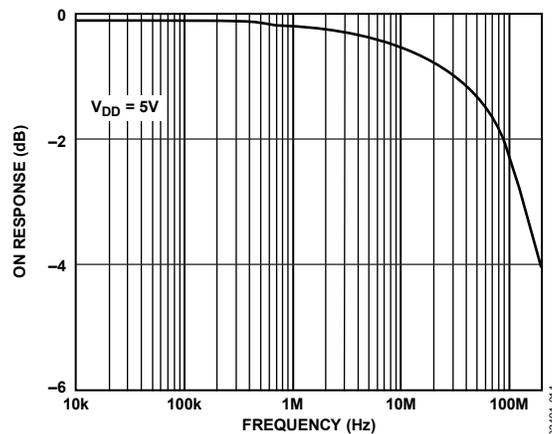
Figure 11. On Response vs. Frequency
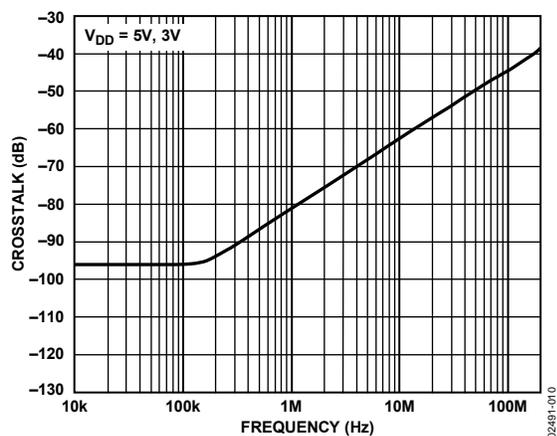
Figure 10. Crosstalk vs. Frequency
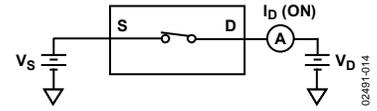
TEST CIRCUITS
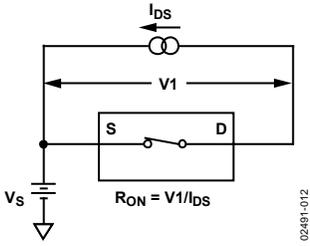
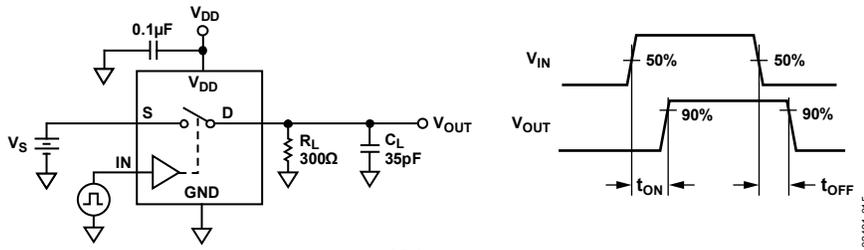Figure 12. On Resistance
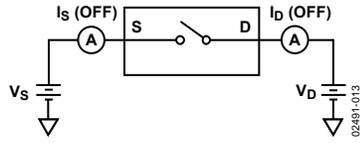
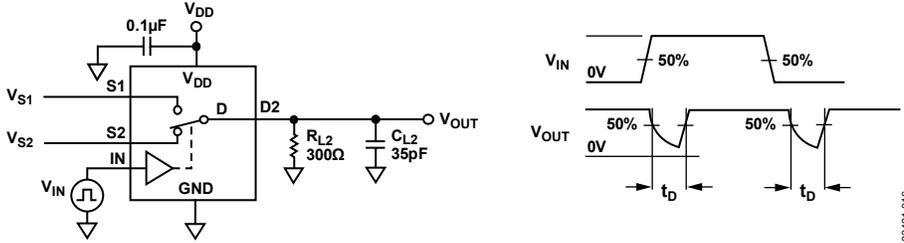Figure 13. Off Leakage
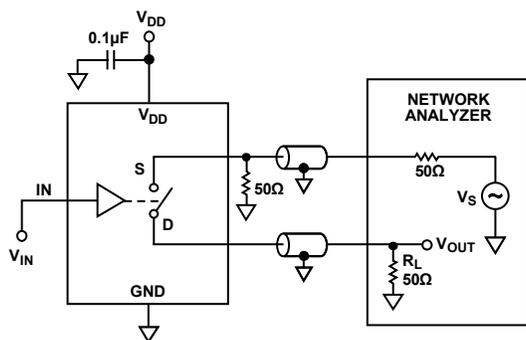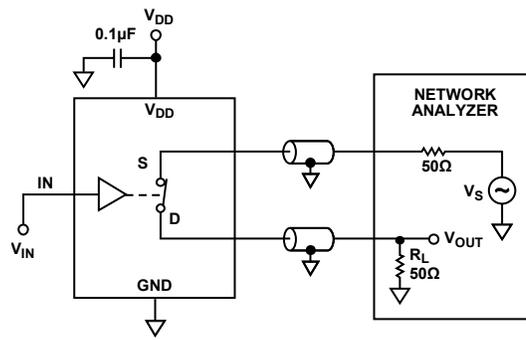

Figure 14. On Leakage

Figure 15. Switching Times

Figure 16. Break-Before-Make Time Delay, t_D

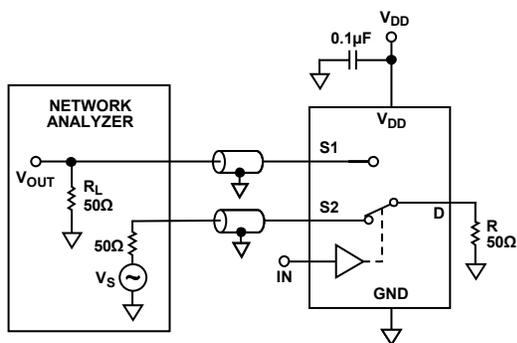OFF ISOLATION = 20 log $\dfrac{V_{OUT}}{V_S}$

02491-017

Figure 17. Off Isolation

INSERTION LOSS = 20 log $\dfrac{V_{OUT} \text{ WITH SWITCH}}{V_{OUT} \text{ WITHOUT SWITCH}}$
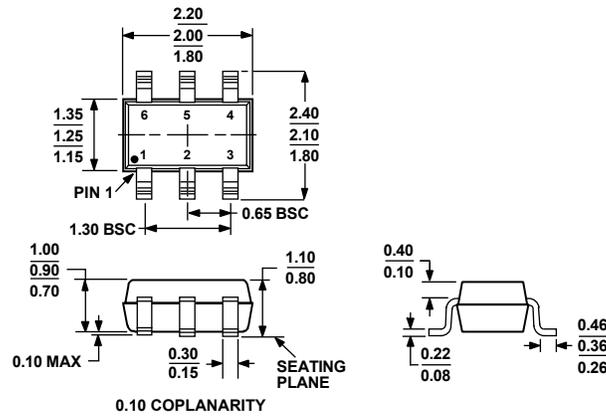
02491-019

Figure 19. Bandwidth

CHANNEL-TO-CHANNEL CROSSTALK = 20 log $\dfrac{V_{OUT}}{V_S}$

02491-018

Figure 18. Channel-to-Channel Crosstalk

ADG779

OUTLINE DIMENSIONS

COMPLIANT TO JEDEC STANDARDS MO-203-AB

Figure 20. 6-Lead Thin Shrink Small Outline Transistor Package [SC70]
(KS-6)
Dimensions shown in millimeters

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Branding[1]
ADG779BKS-R2	−40°C to +85°C	6-Lead Thin Shrink Small Outline Transistor Package (SC70)	KS-6	SKB
ADG779BKS-REEL	−40°C to +85°C	6-Lead Thin Shrink Small Outline Transistor Package (SC70)	KS-6	SKB
ADG779BKS-REEL7	−40°C to +85°C	6-Lead Thin Shrink Small Outline Transistor Package (SC70)	KS-6	SKB
ADG779BKSZ-R2[2]	−40°C to +85°C	6-Lead Thin Shrink Small Outline Transistor Package (SC70)	KS-6	S0M
ADG779BKSZ-REEL[2]	−40°C to +85°C	6-Lead Thin Shrink Small Outline Transistor Package (SC70)	KS-6	S0M
ADG779BKSZ-REEL7[2]	−40°C to +85°C	6-Lead Thin Shrink Small Outline Transistor Package (SC70)	KS-6	S0M

[1] Brand on these packages is limited to three characters due to space constraints.
[2] Z = Pb-free part.

ANALOG DEVICES

www.analog.com

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Analogue Switch ICs *category:*

Click to view products by Analog Devices *manufacturer:*

Other Similar products are found below :

FSA3051TMX NLAS4684FCTCG NLAS5223BLMNR2G NLVAS4599DTT1G NLX2G66DMUTCG 425541DB 425528R 099044FB NLAS5123MNR2G PI5A4157CEX PI5A4599BCEX NLAS4717EPFCT1G PI5A3167CCEX SLAS3158MNR2G PI5A392AQE PI5A4157ZUEX PI5A3166TAEX FSA634UCX TC4066BP(N,F) DG302BDJ-E3 PI5A100QEX HV2605FG-G HV2301FG-G RS2117YUTQK10 RS2118YUTQK10 RS2227XUTQK10 ADG452BRZ-REEL7 MAX4066ESD+ MAX391CPE+ MAX4730EXT+T MAX314CPE+ BU4066BCFV-E2 MAX313CPE+ BU4S66G2-TR NLAS3158MNR2G NLASB3157MTR2G TS3A4751PWR NLAS4157DFT2G NLAS4599DFT2G NLASB3157DFT2G NLAST4599DFT2G NLAST4599DTT1G DG300BDJ-E3 DG2503DB-T2-GE1 DG2502DB-T2-GE1 TC4W53FU(TE12L,F) 74HC2G66DC.125 ADG619BRMZ-REEL ADG1611BRUZ-REEL7 LTC201ACN#PBF