

FEATURES

- 1.8 V to 5.5 V single supply
- ± 2.5 V dual supply
- 3 Ω on resistance
- 0.75 Ω on resistance flatness
- 100 pA leakage currents
- 14 ns switching times
- Single 8-to-1 multiplexer ADG708
- Differential 4-to-1 multiplexer ADG709
- 16-lead TSSOP package
- Low power consumption
- TTL-/CMOS-compatible inputs

APPLICATIONS

- Data acquisition systems
- Communication systems
- Relay replacement
- Audio and video switching
- Battery-powered systems

GENERAL DESCRIPTION

The ADG708 and ADG709 are low voltage, CMOS analog multiplexers comprising eight single channels and four differential channels, respectively. The ADG708 switches one of eight inputs (S1 to S8) to a common output, D, as determined by the 3-bit binary address lines A0, A1, and A2. The ADG709 switches one of four differential inputs to a common differential output as determined by the 2-bit binary address lines A0 and A1. An EN input on both devices is used to enable or disable the device. When disabled, all channels are switched off.

Low power consumption and an operating supply range of 1.8 V to 5.5 V make the ADG708 and ADG709 ideal for battery-powered, portable instruments. All channels exhibit break-before-make switching action preventing momentary shorting when switching channels.

These switches are designed on an enhanced submicron process that provides low power dissipation yet gives high switching speed, very low on resistance, and leakage currents.

FUNCTIONAL BLOCK DIAGRAMS

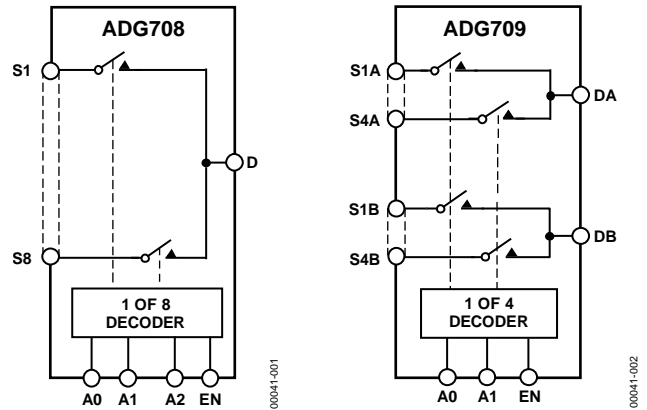


Figure 1.

Figure 2.

On resistance is in the region of a few ohms and is closely matched between switches and very flat over the full signal range. These parts can operate equally well as either multiplexers or demultiplexers and have an input signal range that extends to the supplies.

The ADG708 and ADG709 are available in 16-lead TSSOP packages.

PRODUCT HIGHLIGHTS

1. Single-/dual-supply operation. The ADG708 and ADG709 are fully specified and guaranteed with 3 V and 5 V single supply and ± 2.5 V dual-supply rails.
2. Low R_{ON} (3 Ω typical).
3. Low power consumption (<0.01 μ W).
4. Guaranteed break-before-make switching action.
5. Small 16-lead TSSOP package.

Rev. B

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REVISION HISTORY

8/06—Rev. A to Rev. B

Updated Format.....	Universal
Changes to Absolute Maximum Ratings Section	9
Added Table 7 and Table 8	10
Updated Outline Dimensions	18
Changes to Ordering Guide	18

4/02—Rev. 0 to Rev. A

Edits to FEATURES and PRODUCT HIGHLIGHTS	1
Change to SPECIFICATIONS	2–4
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Edits to TPCs 2, 5, 6–9, 11, and 15.....	7–9
Edits to Test Circuits 9 and 10	11
Addition of Test Circuit 11	11

10/00—Revision 0: Initial Version

SPECIFICATIONS

$V_{DD} = 5\text{ V} \pm 10\%$, $V_{SS} = 0\text{ V}$, $GND = 0\text{ V}$, unless otherwise noted.¹

Table 1.

Parameter	B Version		C Version		Unit	Test Conditions/Comments
	+25°C	-40°C to +85°C	+25°C	-40°C to +85°C		
ANALOG SWITCH						
Analog Signal Range	0 V to V_{DD}		0 V to V_{DD}		V	
On Resistance (R_{ON})	3		3		Ω typ	$V_S = 0\text{ V to }V_{DD}$, $I_{DS} = 10\text{ mA}$; see Figure 20
	4.5	5	4.5	5	Ω max	
On Resistance Match Between Channels (ΔR_{ON})		0.4		0.4	Ω typ	$V_S = 0\text{ V to }V_{DD}$, $I_{DS} = 10\text{ mA}$
		0.8		0.8	Ω max	
On Resistance Flatness ($R_{FLAT(ON)}$)	0.75		0.75		Ω typ	$V_S = 0\text{ V to }V_{DD}$, $I_{DS} = 10\text{ mA}$
		1.2		1.2	Ω max	
LEAKAGE CURRENTS						
Source Off Leakage I_S (OFF)	± 0.01		± 0.01		nA typ	$V_{DD} = 5.5\text{ V}$ $V_D = 4.5\text{ V}/1\text{ V}$, $V_S = 1\text{ V}/4.5\text{ V}$; see Figure 21
		± 20	± 0.1	± 0.3	nA max	
Drain Off Leakage I_D (OFF)	± 0.01		± 0.01		nA typ	$V_D = 4.5\text{ V}/1\text{ V}$, $V_S = 1\text{ V}/4.5\text{ V}$; see Figure 22
		± 20	± 0.1	± 0.75	nA max	
Channel On Leakage I_D , I_S (ON)	± 0.01		± 0.01		nA typ	$V_D = V_S = 1\text{ V or }4.5\text{ V}$; see Figure 23
		± 20	± 0.1	± 0.75	nA max	
DIGITAL INPUTS						
Input High Voltage, V_{INH}		2.4		2.4	V min	$V_{IN} = V_{INL}$ or V_{INH}
Input Low Voltage, V_{INL}		0.8		0.8	V max	
Input Current					μA typ	
I_{INL} or I_{INH}	0.005		0.005		μA max	
Digital Input Capacitance, C_{IN}	2	± 0.1	2	± 0.1	pF typ	
DYNAMIC CHARACTERISTICS²						
$t_{TRANSITION}$	14		14		ns typ	$R_L = 300\ \Omega$, $C_L = 35\text{ pF}$; see Figure 24 $V_{S1} = 3\text{ V}/0\text{ V}$, $V_{S8} = 0\text{ V}/3\text{ V}$
		25		25	ns max	
Break-Before-Make Time Delay, t_{OPEN}	8		8		ns typ	$R_L = 300\ \Omega$, $C_L = 35\text{ pF}$ $V_S = 3\text{ V}$; see Figure 25
		1		1	ns min	
t_{ON} (EN)	14		14		ns typ	$R_L = 300\ \Omega$, $C_L = 35\text{ pF}$ $V_S = 3\text{ V}$; see Figure 26
		25		25	ns max	
t_{OFF} (EN)	7		7		ns typ	$R_L = 300\ \Omega$, $C_L = 35\text{ pF}$ $V_S = 3\text{ V}$; see Figure 26
		12		12	ns max	
Charge Injection	± 3		± 3		pC typ	$V_S = 2.5\text{ V}$, $R_S = 0\ \Omega$, $C_L = 1\text{ nF}$; see Figure 27
Off Isolation	-60		-60		dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 10\text{ MHz}$ $R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 1\text{ MHz}$; see Figure 28
	-80		-80		dB typ	
Channel-to-Channel Crosstalk	-60		-60		dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 10\text{ MHz}$ $R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 1\text{ MHz}$; see Figure 29
	-80		-80		dB typ	
-3 dB Bandwidth	55		55		MHz typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$; see Figure 30 $f = 1\text{ MHz}$
C_S (OFF)	13		13		pF typ	
C_D (OFF)						
ADG708	85		85		pF typ	$f = 1\text{ MHz}$
ADG709	42		42		pF typ	$f = 1\text{ MHz}$

ADG708/ADG709

Parameter	B Version		C Version		Unit	Test Conditions/Comments
	+25°C	-40°C to +85°C	+25°C	-40°C to +85°C		
C _D , C _S (ON)						
ADG708	96		96		pF typ	f = 1 MHz
ADG709	48		48		pF typ	f = 1 MHz
POWER REQUIREMENTS						V _{DD} = 5.5 V
I _{DD}	0.001		0.001		μA typ	Digital inputs = 0 V or 5.5 V
		1.0		1.0	μA max	

¹ Temperature range is as follows: B Version and C Version: -40°C to +85°C.

² Guaranteed by design, not subject to production test.

$V_{DD} = 3\text{ V} \pm 10\%$, $V_{SS} = 0\text{ V}$, $GND = 0\text{ V}$, unless otherwise noted.¹

Table 2.

Parameter	B Version		C Version		Unit	Test Conditions/Comments
	+25°C	-40°C to +85°C	+25°C	-40°C to +85°C		
ANALOG SWITCH						
Analog Signal Range		0 V to V_{DD}		0 V to V_{DD}	V	
On Resistance (R_{ON})	8		8		Ω typ	$V_S = 0\text{ V to }V_{DD}$, $I_{DS} = 10\text{ mA}$; see Figure 20
	11	12	11	12	Ω max	
On Resistance Match Between Channels (ΔR_{ON})		0.4		0.4	Ω typ	$V_S = 0\text{ V to }V_{DD}$, $I_{DS} = 10\text{ mA}$
		1.2		1.2	Ω max	
LEAKAGE CURRENTS						
Source Off Leakage I_S (OFF)	± 0.01		± 0.01		nA typ	$V_{DD} = 3.3\text{ V}$ $V_S = 3\text{ V}/1\text{ V}$, $V_D = 1\text{ V}/3\text{ V}$; see Figure 21
		± 20	± 0.1	± 0.3	nA max	
Drain Off Leakage I_D (OFF)	± 0.01		± 0.01		nA typ	$V_S = 3\text{ V}/1\text{ V}$, $V_D = 1\text{ V}/3\text{ V}$; see Figure 22
		± 20	± 0.1	± 0.75	nA max	
Channel On Leakage I_D , I_S (ON)	± 0.01		± 0.01		nA typ	$V_S = V_D = 1\text{ V or }3\text{ V}$; see Figure 23
		± 20	± 0.1	± 0.75	nA max	
DIGITAL INPUTS						
Input High Voltage, V_{INH}		2.0		2.0	V min	
Input Low Voltage, V_{INL}		0.8		0.8	V max	
Input Current						
I_{INL} or I_{INH}	0.005		0.005		μA typ	$V_{IN} = V_{INL}$ or V_{INH}
		± 0.1		± 0.1	μA max	
Digital Input Capacitance, C_{IN}	2		2		pF typ	
DYNAMIC CHARACTERISTICS²						
$t_{TRANSITION}$	18		18		ns typ	$R_L = 300\ \Omega$, $C_L = 35\text{ pF}$; see Figure 24
		30		30	ns max	$V_{S1} = 2\text{ V}/0\text{ V}$, $V_{S2} = 0\text{ V}/2\text{ V}$
Break-Before-Make Time Delay, t_{OPEN}	8		8		ns typ	$R_L = 300\ \Omega$, $C_L = 35\text{ pF}$
		1		1	ns min	$V_S = 2\text{ V}$; see Figure 25
t_{ON} (EN)	18		18		ns typ	$R_L = 300\ \Omega$, $C_L = 35\text{ pF}$
		30		30	ns max	$V_S = 2\text{ V}$; see Figure 26
t_{OFF} (EN)	8		8		ns typ	$R_L = 300\ \Omega$, $C_L = 35\text{ pF}$
		15		15	ns max	$V_S = 2\text{ V}$; see Figure 26
Charge Injection	± 3		± 3		pC typ	$V_S = 1.5\text{ V}$, $R_S = 0\ \Omega$, $C_L = 1\text{ nF}$; see Figure 27
Off Isolation	-60		-60		dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 10\text{ MHz}$
	-80		-80		dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 1\text{ MHz}$; see Figure 28
Channel-to-Channel Crosstalk	-60		-60		dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 10\text{ MHz}$
	-80		-80		dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 1\text{ MHz}$; see Figure 29
-3 dB Bandwidth	55		55		MHz typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$; see Figure 30
C_S (OFF)	13		13		pF typ	$f = 1\text{ MHz}$
C_D (OFF)						
ADG708	85		85		pF typ	$f = 1\text{ MHz}$
ADG709	42		42		pF typ	$f = 1\text{ MHz}$
C_D , C_S (ON)						
ADG708	96		96		pF typ	$f = 1\text{ MHz}$
ADG709	48		48		pF typ	$f = 1\text{ MHz}$

ADG708/ADG709

Parameter	B Version		C Version		Unit	Test Conditions/Comments
	+25°C	-40°C to +85°C	+25°C	-40°C to +85°C		
POWER REQUIREMENTS						$V_{DD} = 3.3\text{ V}$
I_{DD}	0.001	1.0	0.001	1.0	$\mu\text{A typ}$ $\mu\text{A max}$	Digital inputs = 0 V or 3.3 V

¹ Temperature ranges are as follows: B Version and C Version: -40°C to +85°C.

² Guaranteed by design, not subject to production test.

DUAL SUPPLY

$V_{DD} = +2.5 \text{ V} \pm 10\%$, $V_{SS} = -2.5 \text{ V} \pm 10\%$, $GND = 0 \text{ V}$, unless otherwise noted.¹

Table 3.

Parameter	B Version		C Version		Unit	Test Conditions/Comments
	+25°C	-40°C to +85°C	+25°C	-40°C to +85°C		
ANALOG SWITCH						
Analog Signal Range	V_{SS} to V_{DD}		V_{SS} to V_{DD}		V	
On Resistance (R_{ON})	2.5		2.5		Ω typ	$V_S = V_{SS}$ to V_{DD} , $I_{DS} = 10 \text{ mA}$; see Figure 20
	4.5	5	4.5	5	Ω max	
On Resistance Match Between Channels (ΔR_{ON})	0.4		0.4		Ω typ	$V_S = V_{SS}$ to V_{DD} , $I_{DS} = 10 \text{ mA}$
	0.8		0.8		Ω max	
On Resistance Flatness ($R_{FLAT(ON)}$)	0.6		0.6		Ω typ	$V_S = V_{SS}$ to V_{DD} , $I_{DS} = 10 \text{ mA}$
	1.0		1.0		Ω max	
LEAKAGE CURRENTS						
Source Off Leakage I_S (OFF)	± 0.01		± 0.01		nA typ	$V_{DD} = +2.75 \text{ V}$, $V_{SS} = -2.75 \text{ V}$ $V_S = +2.25 \text{ V}/-1.25 \text{ V}$, $V_D = -1.25 \text{ V}/+2.25 \text{ V}$; see Figure 21
		± 20	± 0.1	± 0.3	nA max	
Drain Off Leakage I_D (OFF)	± 0.01		± 0.01		nA typ	$V_S = +2.25 \text{ V}/-1.25 \text{ V}$, $V_D = -1.25 \text{ V}/+2.25 \text{ V}$; see Figure 22
		± 20	± 0.1	± 0.75	nA max	
Channel On Leakage I_D , I_S (ON)	± 0.01		± 0.01		nA typ	$V_S = V_D = +2.25 \text{ V}/-1.25 \text{ V}$; see Figure 23
		± 20	± 0.1	± 0.75	nA max	
DIGITAL INPUTS						
Input High Voltage, V_{INH}	1.7		1.7		V min	$V_{IN} = V_{INL}$ or V_{INH}
Input Low Voltage, V_{INL}	0.7		0.7		V max	
Input Current					μA typ	
I_{INL} or I_{INH}	0.005		0.005		μA max	
Digital Input Capacitance, C_{IN}	2	± 0.1	2	± 0.1	pF typ	
DYNAMIC CHARACTERISTICS²						
$t_{TRANSITION}$	14		14		ns typ	$R_L = 300 \Omega$, $C_L = 35 \text{ pF}$; see Figure 24
		25		25	ns max	
Break-Before-Make Time Delay, t_{OPEN}	8		8		ns typ	$R_L = 300 \Omega$, $C_L = 35 \text{ pF}$ $V_S = 1.5 \text{ V}$; see Figure 25
		1		1	ns min	
t_{ON} (EN)	14		14		ns typ	$R_L = 300 \Omega$, $C_L = 35 \text{ pF}$ $V_S = 1.5 \text{ V}$; see Figure 26
		25		25	ns max	
t_{OFF} (EN)	8		8		ns typ	$R_L = 300 \Omega$, $C_L = 35 \text{ pF}$ $V_S = 1.5 \text{ V}$; see Figure 26
		15		15	ns max	
Charge Injection	± 3		± 3		pC typ	$V_S = 0 \text{ V}$, $R_S = 0 \Omega$, $C_L = 1 \text{ nF}$; see Figure 27
Off Isolation	-60		-60		dB typ	$R_L = 50 \Omega$, $C_L = 5 \text{ pF}$, $f = 10 \text{ MHz}$
Channel-to-Channel Crosstalk	-80		-80		dB typ	$R_L = 50 \Omega$, $C_L = 5 \text{ pF}$, $f = 1 \text{ MHz}$; see Figure 28
	-60		-60		dB typ	$R_L = 50 \Omega$, $C_L = 5 \text{ pF}$, $f = 10 \text{ MHz}$
-3 dB Bandwidth	55		55		MHz typ	$R_L = 50 \Omega$, $C_L = 5 \text{ pF}$, $f = 1 \text{ MHz}$; see Figure 29
C_S (OFF)	13		13		pF typ	$f = 1 \text{ MHz}$
C_D (OFF)						
ADG708	85		85		pF typ	$f = 1 \text{ MHz}$
ADG709	42		42		pF typ	$f = 1 \text{ MHz}$
C_D , C_S (ON)						
ADG708	96		96		pF typ	$f = 1 \text{ MHz}$
ADG709	48		48		pF typ	$f = 1 \text{ MHz}$

ADG708/ADG709

Parameter	B Version		C Version		Unit	Test Conditions/Comments
	+25°C	-40°C to +85°C	+25°C	-40°C to +85°C		
POWER REQUIREMENTS						$V_{DD} = 2.75\text{ V}$
I_{DD}	0.001		0.001		$\mu\text{A typ}$	Digital inputs = 0 V or 2.75 V
		1.0		1.0	$\mu\text{A max}$	
I_{SS}	0.001		0.001		$\mu\text{A typ}$	$V_{SS} = -2.75\text{ V}$
		1.0		1.0	$\mu\text{A max}$	Digital inputs = 0 V or 2.75 V

¹ Temperature range is as follows: B Version and C 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 4.

Parameter	Rating
V _{DD} to V _{SS}	7 V
V _{DD} to GND	-0.3 V to +7 V
V _{SS} to GND	+0.3 V to -3.5 V
Analog Inputs ¹	V _{SS} - 0.3 V to V _{DD} + 0.3 V or 30 mA, whichever occurs first
Digital Inputs ¹	-0.3 V to V _{DD} + 0.3 V or 30 mA, whichever occurs first
Peak Current, S or D (Pulsed at 1 ms, 10% Duty Cycle Maximum)	100 mA
Continuous Current, S or D	30 mA
Operating Temperature Range	
Industrial (B and C Versions)	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Junction Temperature	150°C
TSSOP Package, Power Dissipation	432 mW
θ _{JA} Thermal Impedance	150.4°C/W
θ _{JC} Thermal Impedance	27.6°C/W
Lead Temperature, Soldering	
Vapor Phase (60 sec)	215°C
Infrared (15 sec)	220°C

¹ Overvoltages at A, EN, S, or D are clamped by internal codes. 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.

Only one absolute maximum rating can be applied at any one time.

Table 5. ADG708 Truth Table

A2	A1	A0	EN	Switch Condition
x ¹	x ¹	x ¹	0	NONE
0	0	0	1	1
0	0	1	1	2
0	1	0	1	3
0	1	1	1	4
1	0	0	1	5
1	0	1	1	6
1	1	0	1	7
1	1	1	1	8

¹ x = don't care.

Table 6. ADG709 Truth Table

A1	A0	EN	ON Switch Pair
x ¹	x ¹	0	NONE
0	0	1	1
0	1	1	2
1	0	1	3
1	1	1	4

¹ x = don't care.

ESD CAUTION



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

ADG708/ADG709

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

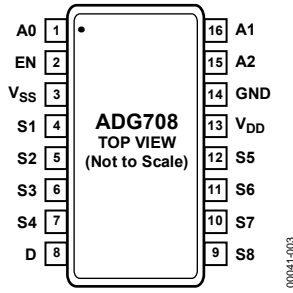


Figure 3. ADG708 TSSOP

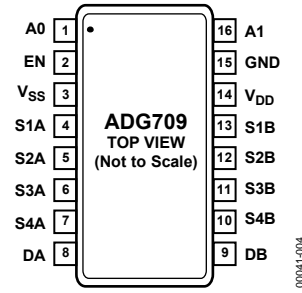


Figure 4. ADG709 TSSOP

Table 7. ADG708 Pin Function Descriptions

Pin No.	Mnemonic	Description
1	A0	Digital Input. Controls the configuration of the switch, as shown in the truth table (see Table 5).
2	EN	Digital Input. Controls the configuration of the switch, as shown in the truth table (see Table 5).
3	V _{SS}	Most Negative Power Supply Pin in Dual Supply Applications. For single supply applications, it should be tied to GND.
4	S1	Source Terminal. Can be an input or output.
5	S2	Source Terminal. Can be an input or output.
6	S3	Source Terminal. Can be an input or output.
7	S4	Source Terminal. Can be an input or output.
8	D	Drain Terminal. Can be an input or output.
9	S8	Source Terminal. Can be an input or output.
10	S7	Source Terminal. Can be an input or output.
11	S6	Source Terminal. Can be an input or output.
12	S5	Source Terminal. Can be an input or output.
13	V _{DD}	Most Positive Power Supply Pin.
14	GND	Ground (0 V) Reference.
15	A2	Digital Input. Controls the configuration of the switch, as shown in the truth table (see Table 5).
16	A1	Digital Input. Controls the configuration of the switch, as shown in the truth table (see Table 5).

Table 8. ADG709 Pin Function Descriptions

Pin No.	Mnemonic	Description
1	A0	Digital Input. Controls the configuration of the switch, as shown in the truth table (see Table 6).
2	EN	Digital Input. Controls the configuration of the switch, as shown in the truth table (see Table 6).
3	V _{SS}	Most negative power supply pin in dual supply applications. For single supply applications, it should be tied to GND.
4	S1A	Source Terminal. Can be an input or output.
5	S2A	Source Terminal. Can be an input or output.
6	S3A	Source Terminal. Can be an input or output.
7	S4A	Source Terminal. Can be an input or output.
8	DA	Drain Terminal. Can be an input or output.
9	DB	Drain Terminal. Can be an input or output.
10	S4B	Source Terminal. Can be an input or output.
11	S3B	Source Terminal. Can be an input or output.
12	S2B	Source Terminal. Can be an input or output.
13	S1B	Source Terminal. Can be an input or output.
14	V _{DD}	Most Positive Power Supply Pin.
15	GND	Ground (0 V) Reference.
16	A1	Digital Input. Controls the configuration of the switch, as shown in the truth table (see Table 6).

TERMINOLOGY

V_{DD}

Most positive power supply potential.

VSS

Most negative power supply in a dual-supply application. In single-supply applications, this should be tied to ground at the device.

GND

Ground (0 V) reference.

S

Source terminal. Can be an input or output.

D

Drain terminal. Can be an input or output.

Ax

Logic control input.

EN

Active high enable.

R_{ON}

Ohmic resistance between D and S.

$R_{FLAT(ON)}$

Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal range.

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_D (V_S)

Analog voltage on Terminal D and Terminal S.

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.

$t_{TRANSITION}$

Delay time measured between the 50% and 90% points of the digital inputs and the switch on condition when switching from one address state to another.

t_{ON} (EN)

Delay time between the 50% and 90% points of the EN digital input and the switch on condition.

t_{OFF} (EN)

Delay time between the 50% and 90% points of the EN digital input and the switch off condition.

t_{OPEN}

Off time measured between the 80% points of both switches when switching from one address state to another.

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 as a result of parasitic capacitance.

Charge

A measure of the glitch impulse transferred from injection of the digital input to the analog output during switching.

Bandwidth

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

On Response

The frequency response of the on switch.

On Loss

The loss due to the on resistance of the switch.

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.

I_{DD}

Positive supply current.

I_{SS}

Negative supply current.

TYPICAL PERFORMANCE CHARACTERISTICS

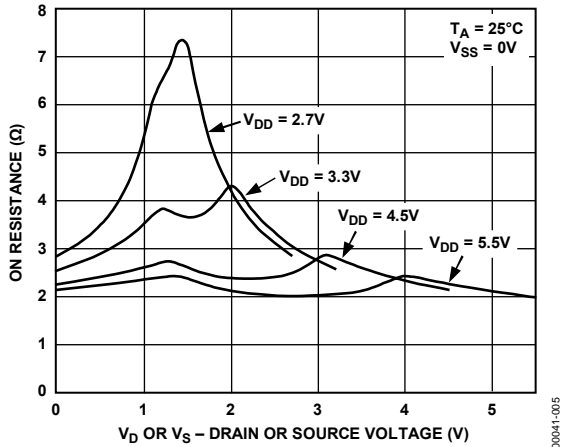


Figure 5. On Resistance as a Function of V_D (V_S) for Single Supply

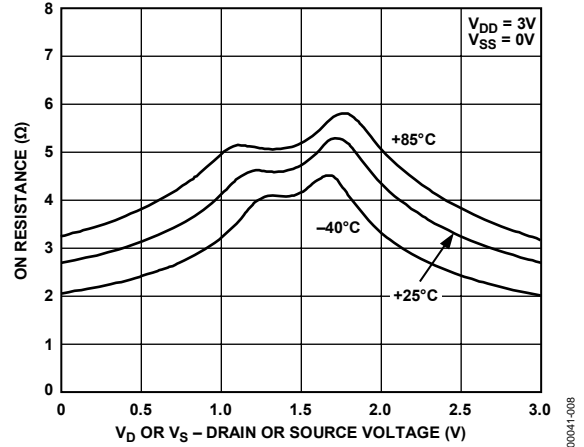


Figure 8. On Resistance as a Function of V_D (V_S) for Different Temperatures, Single Supply

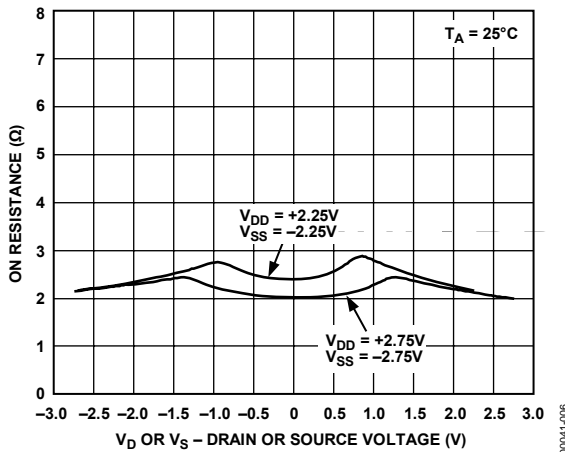


Figure 6. On Resistance as a Function of V_D (V_S) for Dual Supply

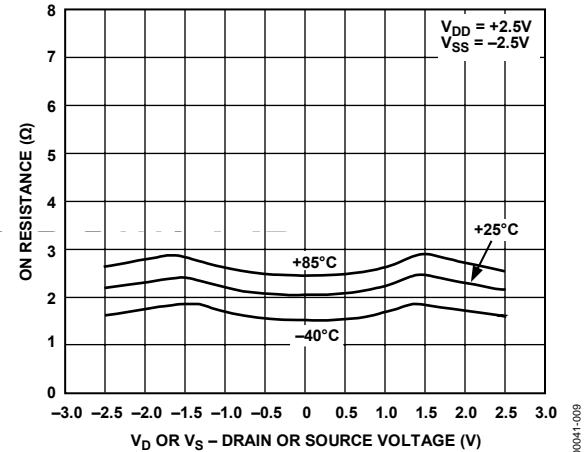


Figure 9. On Resistance as a Function of V_D (V_S) for Different Temperatures, Dual Supply

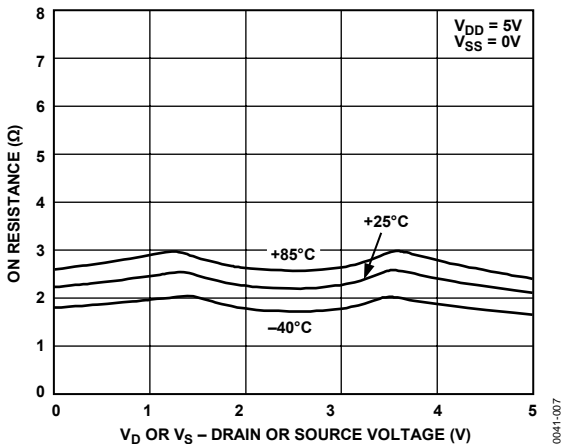


Figure 7. On Resistance as a Function of V_D (V_S) for Different Temperatures, Single Supply

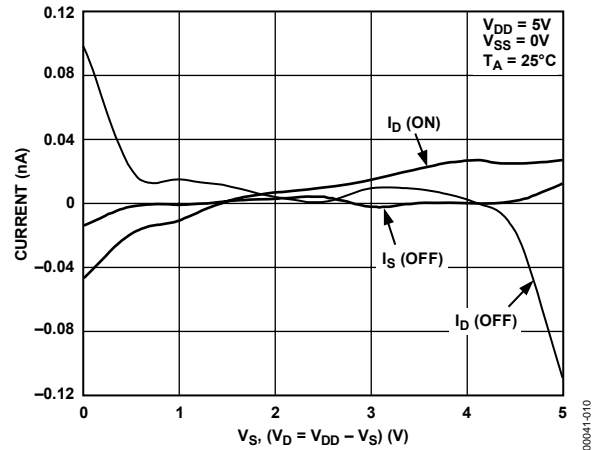


Figure 10. Leakage Currents as a Function of V_D (V_S)

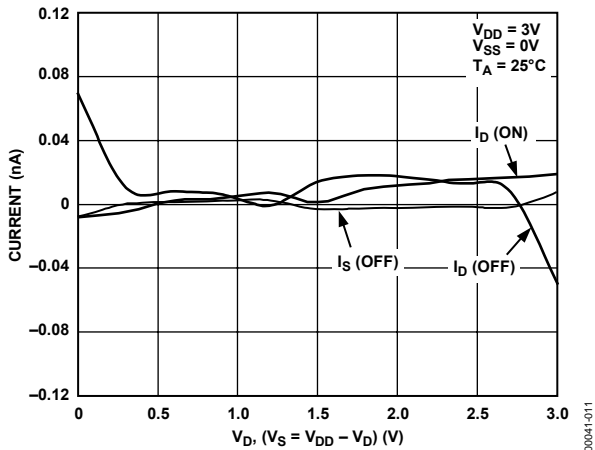


Figure 11. Leakage Currents as a Function of V_D (V_S)

00041-011

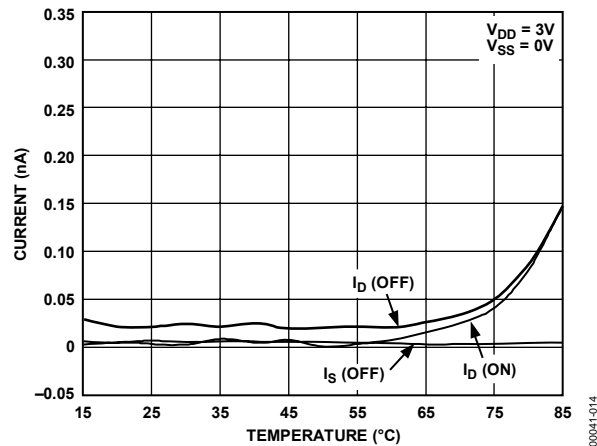


Figure 14. Leakage Currents as a Function of Temperature

00041-014

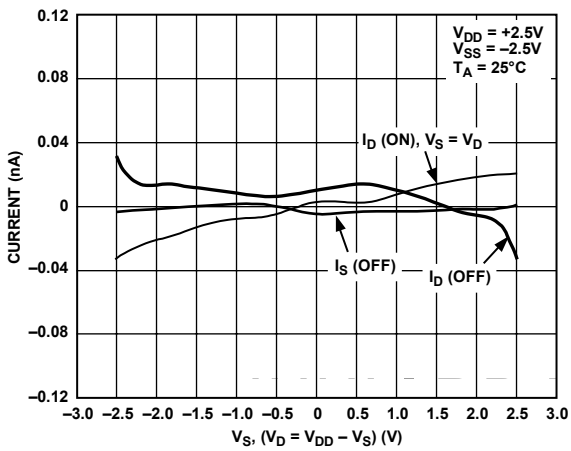


Figure 12. Leakage Currents as a Function of V_D (V_S)

00041-012

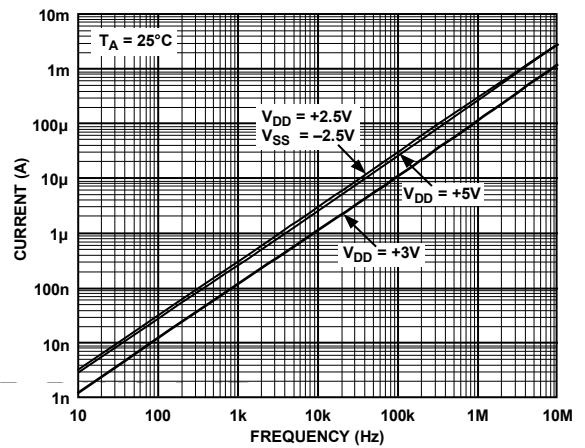


Figure 15. Supply Current vs. Input Switching Frequency

00041-015

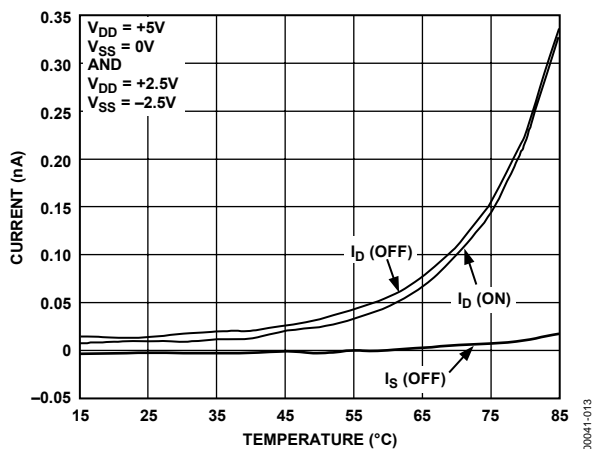


Figure 13. Leakage Currents as a Function of Temperature

00041-013

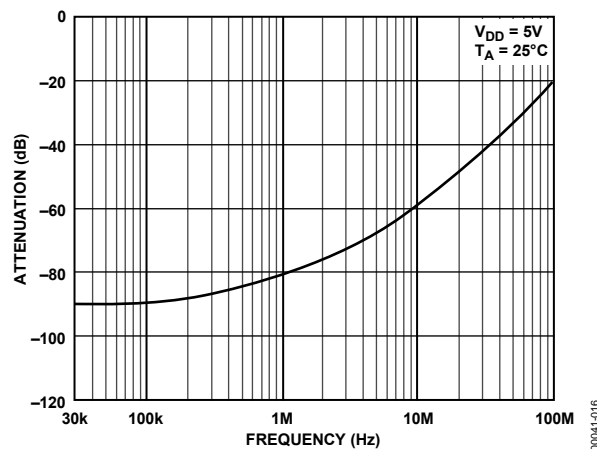


Figure 16. Off Isolation vs. Frequency

00041-016

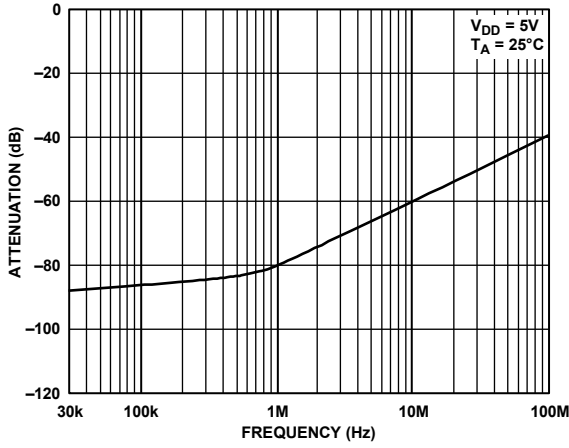


Figure 17. Crosstalk vs. Frequency

00041-017

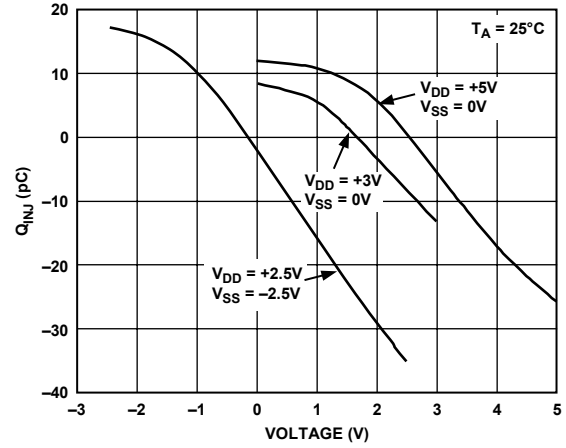


Figure 19. Charge Injection vs. Source Voltage

00041-019

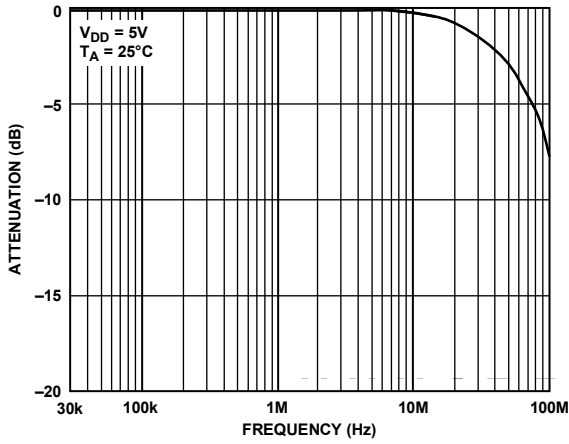


Figure 18. On Response vs. Frequency

00041-018

TEST CIRCUITS

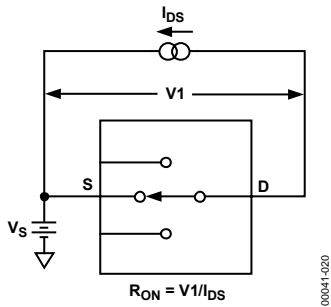


Figure 20. On Resistance

00041-020

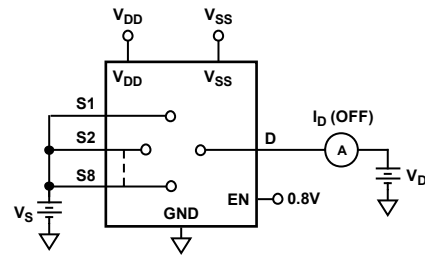


Figure 22. I_D (OFF)

00041-022

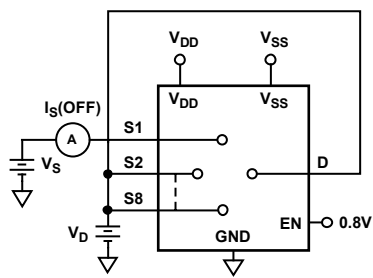


Figure 21. I_S (OFF)

00041-021

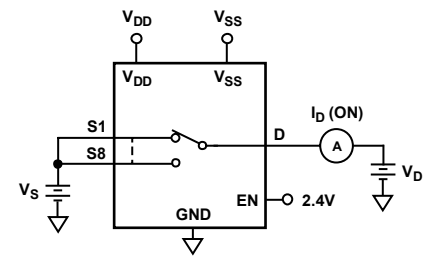
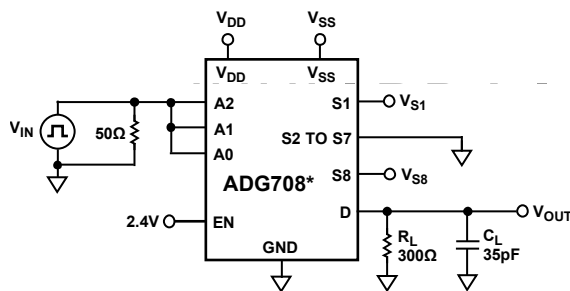


Figure 23. I_D (ON)

00041-023



*SIMILAR CONNECTION FOR ADG709.

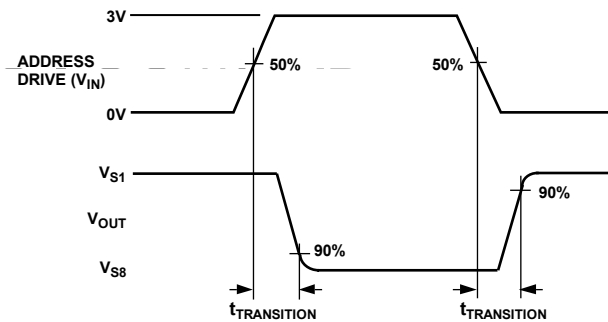
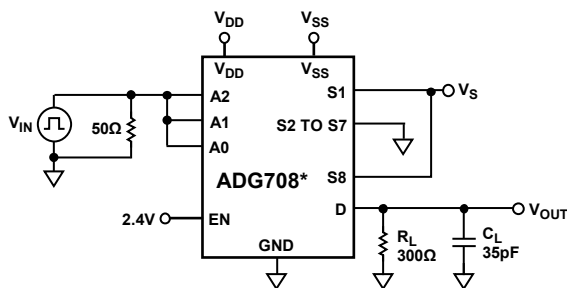


Figure 24. Switching Time of Multiplexer, $t_{TRANSITION}$

00041-024



*SIMILAR CONNECTION FOR ADG709.

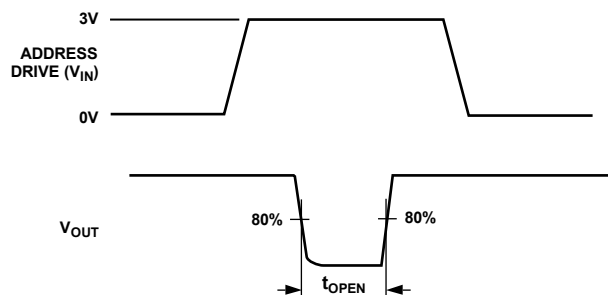
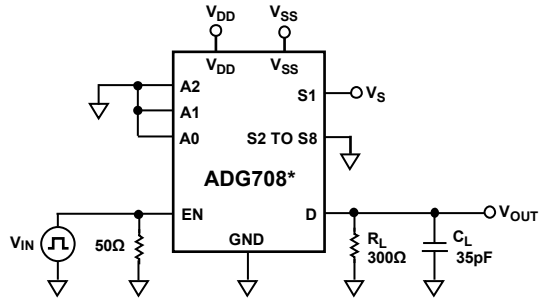


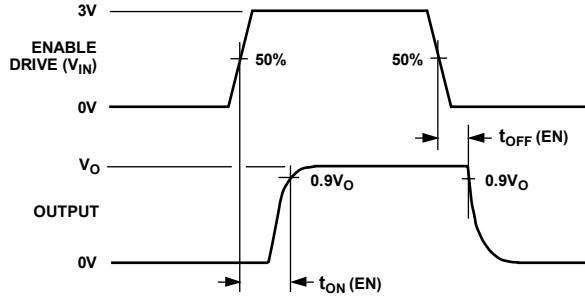
Figure 25. Break-Before-Make Delay, t_{OPEN}

00041-025

ADG708/ADG709

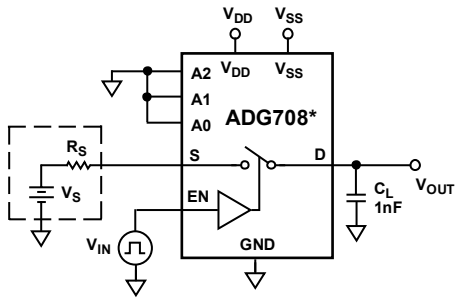


*SIMILAR CONNECTION FOR ADG709.

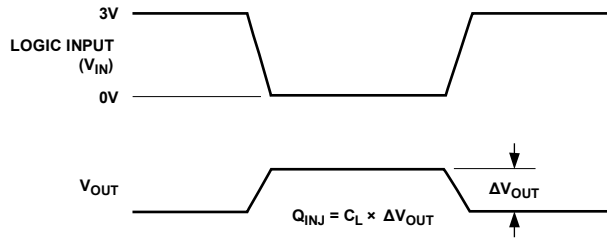


00041-026

Figure 26. Enable Delay, $t_{ON}(EN)$, $t_{OFF}(EN)$

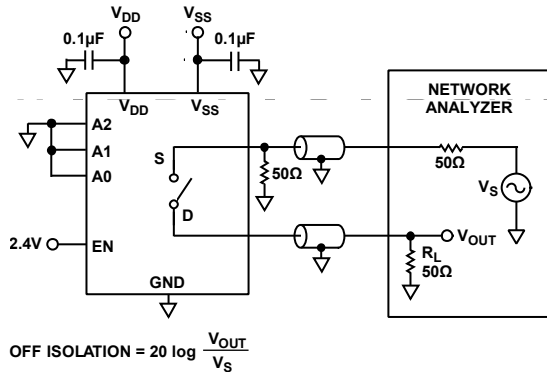


*SIMILAR CONNECTION FOR ADG709.



00041-027

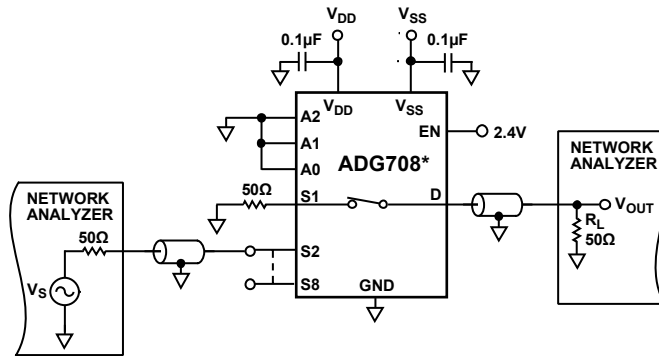
Figure 27. Charge Injection



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

00041-028

Figure 28. Off Isolation

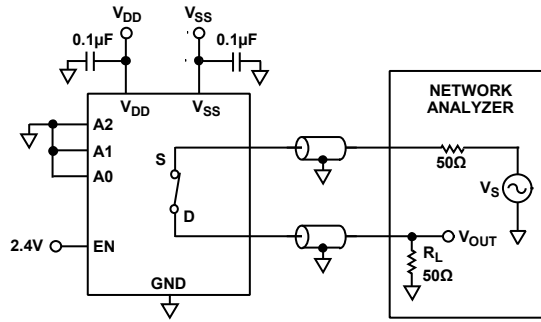


*SIMILAR CONNECTION FOR ADG709.

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

00041-029

Figure 29. Channel-to-Channel Crosstalk



$$\text{INSERTION LOSS} = 20 \log \frac{V_{\text{OUT WITH SWITCH}}}{V_{\text{OUT WITHOUT SWITCH}}}$$

Figure 30. Bandwidth

00041-030

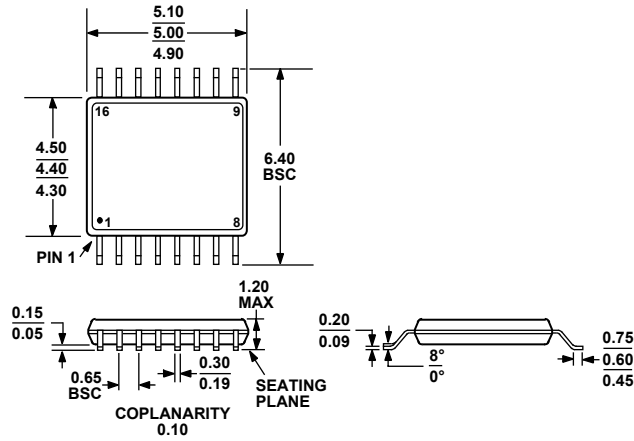
POWER-SUPPLY SEQUENCING

When using CMOS devices, care must be taken to ensure correct power supply sequencing. Incorrect power supply sequencing can result in the device being subjected to stresses beyond the maximum ratings listed in the data sheet.

Digital and analog inputs should always be applied after power supplies and ground. For single-supply operation, V_{SS} should be tied to GND as close to the device as possible.

ADG708/ADG709

OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MO-153-AB

Figure 31. 16-Lead Thin Shrink Small Outline Package [TSSOP]
(RU-16)

Dimensions shown in millimeters

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
ADG708BRU	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708BRU-REEL	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708BRU-REEL7	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708BRUZ ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708BRUZ-REEL ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708BRUZ-REEL7 ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708CRU	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708CRU-REEL	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708CRU-REEL7	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708CRUZ ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708CRUZ-REEL ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG708CRUZ-REEL7 ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709BRU	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709BRU-REEL	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709BRU-REEL7	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709BRUZ ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709BRUZ-REEL ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709BRUZ-REEL7 ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709CRU	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709CRU-REEL	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709CRU-REEL7	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709CRUZ ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709CRUZ-REEL ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16
ADG709CRUZ-REEL7 ¹	-40°C to +85°C	16-Lead Thin Shrink Small Outline Package (TSSOP)	RU-16

¹ Z = Pb-free part.

NOTES

NOTES