

### FEATURES

- 2.1  $\Omega$  on resistance
- 0.5  $\Omega$  maximum on resistance flatness
- Up to 250 mA continuous current
- Fully specified at  $+12$  V,  $\pm 15$  V,  $\pm 5$  V
- No  $V_L$  supply required
- 3 V logic-compatible inputs
- Rail-to-rail operation
- 10-lead MSOP and 10-lead, 3 mm  $\times$  3 mm LFCSP packages

### APPLICATIONS

- Automatic test equipment
- Data acquisition systems
- Relay replacements
- Battery-powered systems
- Sample-and-hold systems
- Audio signal routing
- Video signal routing
- Communication systems

### GENERAL DESCRIPTION

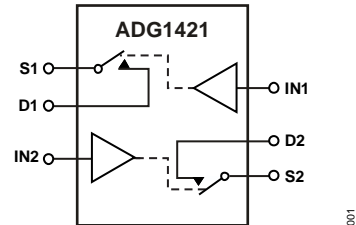
The ADG1421/ADG1422/ADG1423 contain two independent single-pole/single-throw (SPST) switches. The ADG1421 and ADG1422 differ only in that the digital control logic is inverted. The ADG1421 switches are turned on with Logic 1 on the appropriate control input, and Logic 0 is required for the ADG1422. The ADG1423 has one switch with digital control logic similar to that of the ADG1421; the logic is inverted on the other switch. The ADG1423 exhibits break-before-make switching action for use in multiplexer applications. Each switch conducts equally well in both directions when on and has an input signal range that extends to the supplies. In the off condition, signal levels up to the supplies are blocked.

The *i*CMOS<sup>®</sup> (industrial CMOS) modular manufacturing process combines high voltage, complementary metal-oxide semiconductor (CMOS) and bipolar technologies. It enables the development of a wide range of high performance analog ICs capable of 33 V operation in a footprint that no other generation of high voltage parts has achieved. Unlike analog ICs using conventional CMOS processes, *i*CMOS components can tolerate high supply voltages while providing increased performance, dramatically lower power consumption, and reduced package size.

#### Rev. 0

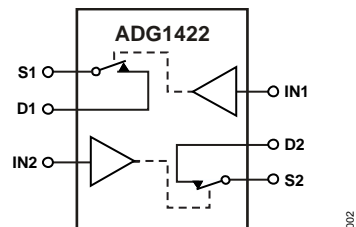
Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

### FUNCTIONAL BLOCK DIAGRAM



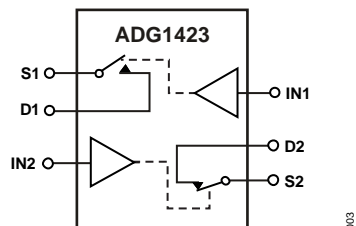
SWITCHES SHOWN FOR A LOGIC 0 INPUT

Figure 1. ADG1421 Functional Block Diagram



SWITCHES SHOWN FOR A LOGIC 0 INPUT

Figure 2. ADG1422 Functional Block Diagram



SWITCHES SHOWN FOR A LOGIC 0 INPUT

Figure 3. ADG1423 Functional Block Diagram

The on resistance profile is very flat over the full analog input range ensuring excellent linearity and low distortion when switching audio signals. The *i*CMOS construction ensures ultralow power dissipation, making the part ideally suited for portable and battery-powered instruments.

### PRODUCT HIGHLIGHTS

1. 2.4  $\Omega$  maximum on resistance at 25°C.
2. Minimum distortion.
3. 3 V logic-compatible digital inputs:  $V_{INH} = 2.0$  V,  $V_{INL} = 0.8$  V.
4. No  $V_L$  logic power supply required.
5. 10-lead MSOP and 10-lead, 3 mm  $\times$  3 mm LFCSP packages.

**TABLE OF CONTENTS**

Features .....	1	Continuous Current per Channel, S or D .....	6
Applications .....	1	Absolute Maximum Ratings .....	7
General Description .....	1	Thermal Resistance .....	7
Functional Block Diagram .....	1	ESD Caution .....	7
Product Highlights .....	1	Pin Configuration and Function Descriptions .....	8
Revision History .....	2	Typical Performance Characteristics .....	9
Specifications .....	3	Test Circuits .....	12
±15 V Dual Supply .....	3	Terminology .....	14
+12 V Single Supply .....	4	Outline Dimensions .....	15
±5 V Dual Supply .....	5	Ordering Guide .....	15

**REVISION HISTORY**

10/09—Revision 0: Initial Version

# SPECIFICATIONS

## ±15 V DUAL SUPPLY

$V_{DD} = +15\text{ V} \pm 10\%$ ,  $V_{SS} = -15\text{ V} \pm 10\%$ , GND = 0 V, unless otherwise noted.

Table 1.

Parameter	25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
<b>ANALOG SWITCH</b>					
Analog Signal Range			$V_{DD}$ to $V_{SS}$	V	
On Resistance, $R_{ON}$	2.1			$\Omega$ typ	$V_S = \pm 10\text{ V}$ , $I_S = -10\text{ mA}$ ; see Figure 23
	2.4	2.8	3.2	$\Omega$ max	$V_{DD} = +13.5\text{ V}$ , $V_{SS} = -13.5\text{ V}$
On Resistance Match Between Channels, $\Delta R_{ON}$	0.02			$\Omega$ typ	$V_S = \pm 10\text{ V}$ , $I_S = -10\text{ mA}$
	0.1	0.12	0.13	$\Omega$ max	
On Resistance Flatness, $R_{FLAT(ON)}$	0.4			$\Omega$ typ	$V_S = \pm 10\text{ V}$ , $I_S = -10\text{ mA}$
	0.5	0.6	0.65	$\Omega$ max	
<b>LEAKAGE CURRENTS</b>					
Source Off Leakage, $I_S$ (Off)	$\pm 0.1$			nA typ	$V_{DD} = +16.5\text{ V}$ , $V_{SS} = -16.5\text{ V}$
	$\pm 0.5$	$\pm 2$	$\pm 75$	nA max	$V_S = \pm 10\text{ V}$ , $V_D = \pm 10\text{ V}$ ; see Figure 24
Drain Off Leakage, $I_D$ (Off)	$\pm 0.1$			nA typ	$V_S = \pm 10\text{ V}$ , $V_D = \pm 10\text{ V}$ ; see Figure 24
	$\pm 0.5$	$\pm 2$	$\pm 75$	nA max	
Channel On Leakage, $I_D$ , $I_S$ (On)	$\pm 0.2$			nA typ	$V_S = V_D = \pm 10\text{ V}$ ; see Figure 25
	$\pm 1$	$\pm 2$	$\pm 75$	nA max	
<b>DIGITAL INPUTS</b>					
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			$\mu\text{A}$ typ	$V_{IN} = V_{GND}$ or $V_{DD}$
			$\pm 0.1$	$\mu\text{A}$ max	
Digital Input Capacitance, $C_{IN}$	4			pF typ	
<b>DYNAMIC CHARACTERISTICS<sup>1</sup></b>					
$t_{ON}$	115			ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
	145	180	210	ns max	$V_S = 10\text{ V}$ ; see Figure 26
$t_{OFF}$	115			ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
	145	165	190	ns max	$V_S = 10\text{ V}$ ; see Figure 26
Break-Before-Make Time Delay, $t_D$ (ADG1423 Only)	45			ns typ	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$
			30	ns min	$V_{S1} = V_{S2} = 10\text{ V}$ ; see Figure 27
Charge Injection	-5			pC typ	$V_S = 0\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ; see Figure 28
Off Isolation	-64			dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 29
Channel-to-Channel Crosstalk	-74			dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 30
Total Harmonic Distortion + Noise	0.016			% typ	$R_L = 10\text{ k}\Omega$ , 5 V rms, $f = 20\text{ Hz}$ to 20 kHz; see Figure 32
-3 dB Bandwidth	180			MHz typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; see Figure 31
Insertion Loss	0.12			dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 31
$C_S$ (Off)	18			pF typ	$f = 1\text{ MHz}$ ; $V_S = 0\text{ V}$
$C_D$ (Off)	22			pF typ	$f = 1\text{ MHz}$ ; $V_S = 0\text{ V}$
$C_D$ , $C_S$ (On)	86			pF typ	$f = 1\text{ MHz}$ ; $V_S = 0\text{ V}$

# ADG1421/ADG1422/ADG1423

Parameter	25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
<b>POWER REQUIREMENTS</b>					
$I_{DD}$	0.002		1.0	$\mu\text{A typ}$ $\mu\text{A max}$	$V_{DD} = +16.5\text{ V}$ , $V_{SS} = -16.5\text{ V}$ Digital inputs = 0 V or $V_{DD}$
$I_{DD}$	120		190	$\mu\text{A typ}$ $\mu\text{A max}$	Digital inputs = 5 V
$I_{SS}$	0.002		1.0	$\mu\text{A typ}$ $\mu\text{A max}$	Digital inputs = 0 V, 5 V, or $V_{DD}$
$V_{DD}/V_{SS}$			$\pm 4.5/\pm 16.5$	V min/max	Ground = 0 V

<sup>1</sup> Guaranteed by design, not subject to production test.

## +12 V SINGLE SUPPLY

$V_{DD} = 12\text{ V} \pm 10\%$ ,  $V_{SS} = 0\text{ V}$ , GND = 0 V, unless otherwise noted.

**Table 2.**

Parameter	25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
<b>ANALOG SWITCH</b>					
Analog Signal Range			0 V to $V_{DD}$	V	
On Resistance, $R_{ON}$	4			$\Omega$ typ $\Omega$ max	$V_S = 0\text{ V to }10\text{ V}$ , $I_S = -10\text{ mA}$ ; see Figure 23 $V_{DD} = 10.8\text{ V}$ , $V_{SS} = 0\text{ V}$
On Resistance Match Between Channels, $\Delta R_{ON}$	0.03	0.15	0.17	$\Omega$ typ $\Omega$ max	$V_S = 0\text{ V to }10\text{ V}$ , $I_S = -10\text{ mA}$
On Resistance Flatness, $R_{FLAT(ON)}$	1.2	1.5	1.75	$\Omega$ typ $\Omega$ max	$V_S = 0\text{ V to }10\text{ V}$ , $I_S = -10\text{ mA}$
<b>LEAKAGE CURRENTS</b>					
Source Off Leakage, $I_S$ (Off)	$\pm 0.05$	$\pm 2$	$\pm 75$	nA typ nA max	$V_{DD} = 13.2\text{ V}$ , $V_{SS} = 0\text{ V}$ $V_S = 1\text{ V}/10\text{ V}$ , $V_D = 10\text{ V}/1\text{ V}$ ; see Figure 24
Drain Off Leakage, $I_D$ (Off)	$\pm 0.05$	$\pm 2$	$\pm 75$	nA typ nA max	$V_S = 1\text{ V}/10\text{ V}$ , $V_D = 10\text{ V}/1\text{ V}$ ; see Figure 24
Channel On Leakage, $I_D$ , $I_S$ (On)	$\pm 0.1$	$\pm 2$	$\pm 75$	nA typ nA max	$V_S = V_D = 1\text{ V or }10\text{ V}$ ; see Figure 25
<b>DIGITAL INPUTS</b>					
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		$\pm 0.1$	$\mu\text{A typ}$ $\mu\text{A max}$	$V_{IN} = V_{GND}$ or $V_{DD}$
Digital Input Capacitance, $C_{IN}$	4			pF typ	
<b>DYNAMIC CHARACTERISTICS<sup>1</sup></b>					
$t_{ON}$	180			ns typ ns max	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$ $V_S = 8\text{ V}$ ; see Figure 26
$t_{OFF}$	130	295	340	ns typ ns max	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$ $V_S = 8\text{ V}$ ; see Figure 26
Break-Before-Make Time Delay, $t_D$ (ADG1433 Only)	70	205	235	ns typ ns min	$R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$ $V_{S1} = V_{S2} = 8\text{ V}$ ; see Figure 27
Charge Injection	30		48	pC typ	$V_S = 6\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ; see Figure 28
Off Isolation	-60			dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 29
Channel-to-Channel Crosstalk	-70			dB typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 30
-3 dB Bandwidth	140			MHz typ	$R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; see Figure 31

Parameter	25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
Insertion Loss	0.26			dB typ	$R_L = 50\ \Omega$ , $C_L = 5\ \text{pF}$ , $f = 1\ \text{MHz}$ ; see Figure 31
$C_S$ (Off)	31			pF typ	$f = 1\ \text{MHz}$ ; $V_S = 6\ \text{V}$
$C_D$ (Off)	36			pF typ	$f = 1\ \text{MHz}$ ; $V_S = 6\ \text{V}$
$C_D$ , $C_S$ (On)	90			pF typ	$f = 1\ \text{MHz}$ ; $V_S = 6\ \text{V}$
<b>POWER REQUIREMENTS</b>					
$I_{DD}$	0.001			$\mu\text{A typ}$	$V_{DD} = 13.2\ \text{V}$ Digital inputs = 0 V or $V_{DD}$
			1.0	$\mu\text{A max}$	
$I_{DD}$	120			$\mu\text{A typ}$	Digital inputs = 5 V
			190	$\mu\text{A max}$	
$V_{DD}$			5/16.5	V min/max	Ground = 0 V, $V_{SS} = 0\ \text{V}$

<sup>1</sup> Guaranteed by design, not subject to production test.

### ±5 V DUAL SUPPLY

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

Table 3.

Parameter	25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
<b>ANALOG SWITCH</b>					
Analog Signal Range			$V_{DD}$ to $V_{SS}$	V	
On Resistance, $R_{ON}$	4.5			$\Omega$ typ	$V_S = \pm 4.5\ \text{V}$ , $I_S = -10\ \text{mA}$ ; see Figure 23
	5.2	6.2	7	$\Omega$ max	$V_{DD} = +4.5\ \text{V}$ , $V_{SS} = -4.5\ \text{V}$
On Resistance Match Between Channels, $\Delta R_{ON}$	0.04			$\Omega$ typ	$V_S = \pm 4.5\ \text{V}$ ; $I_S = -10\ \text{mA}$
	0.18	0.2	0.21	$\Omega$ max	
On Resistance Flatness, $R_{FLAT(ON)}$	1.3			$\Omega$ typ	$V_S = \pm 4.5\ \text{V}$ , $I_S = -10\ \text{mA}$
	1.6	1.85	2	$\Omega$ max	
<b>LEAKAGE CURRENTS</b>					
Source Off Leakage, $I_S$ (Off)	±0.05			nA typ	$V_{DD} = +5.5\ \text{V}$ , $V_{SS} = -5.5\ \text{V}$ $V_S = \pm 4.5\ \text{V}$ , $V_D = \mp 4.5\ \text{V}$ ; see Figure 24
	±0.5	±2	±75	nA max	
Drain Off Leakage, $I_D$ (Off)	±0.05			nA typ	$V_S = \pm 4.5\ \text{V}$ , $V_D = \mp 4.5\ \text{V}$ ; see Figure 24
	±0.5	±2	±75	nA max	
Channel On Leakage, $I_D$ , $I_S$ (On)	±0.1			nA typ	$V_S = V_D = \pm 4.5\ \text{V}$ ; see Figure 25
	±1	±2	±75	nA max	
<b>DIGITAL INPUTS</b>					
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			$\mu\text{A typ}$	$V_{IN} = V_{GND}$ or $V_{DD}$
			±0.1	$\mu\text{A max}$	
Digital Input Capacitance, $C_{IN}$	4			pF typ	

# ADG1421/ADG1422/ADG1423

Parameter	25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
<b>DYNAMIC CHARACTERISTICS<sup>1</sup></b>					
t <sub>ON</sub>	285			ns typ	R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF
	370	460	520	ns max	V <sub>S</sub> = 3 V; see Figure 26
t <sub>OFF</sub>	220			ns typ	R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF
	295	350	395	ns max	V <sub>S</sub> = 3 V; see Figure 26
Break-Before-Make Time Delay, t <sub>D</sub> (ADG1433 Only)	85			ns typ	R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF
			45	ns min	V <sub>S1</sub> = V <sub>S2</sub> = 3 V; see Figure 27
Charge Injection	82			pC typ	V <sub>S</sub> = 0 V, R <sub>S</sub> = 0 Ω, C <sub>L</sub> = 1 nF; see Figure 28
Off Isolation	-60			dB typ	R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz; see Figure 29
Channel-to-Channel Crosstalk	-70			dB typ	R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz; see Figure 30
Total Harmonic Distortion + Noise	0.04			% typ	R <sub>L</sub> = 10 kΩ, 5 V p-p, f = 20 Hz to 20 kHz; see Figure 32
-3 dB Bandwidth	150			MHz typ	R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF; see Figure 31
Insertion Loss	0.25			dB typ	R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz; see Figure 31
C <sub>S</sub> (Off)	25			pF typ	V <sub>S</sub> = 0V, f = 1 MHz
C <sub>D</sub> (Off)	30			pF typ	V <sub>S</sub> = 0V, f = 1 MHz
C <sub>D</sub> , C <sub>S</sub> (On)	100			pF typ	V <sub>S</sub> = 0V, f = 1 MHz
<b>POWER REQUIREMENTS</b>					
I <sub>DD</sub>	0.001		1.0	μA typ μA max	V <sub>DD</sub> = 5.5 V, V <sub>SS</sub> = -5.5 V Digital inputs = 0 V or V <sub>DD</sub>
I <sub>SS</sub>	0.001		1.0	μA typ μA max	Digital inputs = 0 V or V <sub>DD</sub>
V <sub>DD</sub> /V <sub>SS</sub>			±4.5/±16.5	V min/max	Ground = 0 V

<sup>1</sup> Guaranteed by design, not subject to production test.

## CONTINUOUS CURRENT PER CHANNEL, S OR D

Table 4.

Parameter	25°C	85°C	125°C	Unit	Test Conditions/Comments
<b>CONTINUOUS CURRENT PER CHANNEL<sup>1</sup></b>					
±15 V Dual Supply					V <sub>DD</sub> = +13.5 V, V <sub>SS</sub> = -13.5 V
10-Lead MSOP (θ <sub>JA</sub> = 142°C/W)	185	120	75	mA maximum	
10-Lead LFCSP (θ <sub>JA</sub> = 76°C/W)	250	155	85	mA maximum	
+12 V Single Supply					V <sub>DD</sub> = 10.8 V, V <sub>SS</sub> = 0 V
10-Lead MSOP (θ <sub>JA</sub> = 142°C/W)	150	100	65	mA maximum	
10-Lead LFCSP (θ <sub>JA</sub> = 76°C/W)	205	130	80	mA maximum	
±5 V Dual Supply					V <sub>DD</sub> = +4.5 V, V <sub>SS</sub> = -4.5 V
10-Lead MSOP (θ <sub>JA</sub> = 142°C/W)	145	100	65	mA maximum	
10-Lead LFCSP (θ <sub>JA</sub> = 76°C/W)	195	125	75	mA maximum	

<sup>1</sup> Guaranteed by design, not subject to production test.

## ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$ , unless otherwise noted.

Table 5.

Parameter	Rating
$V_{DD}$ to $V_{SS}$	35 V
$V_{DD}$ to GND	-0.3 V to +25 V
$V_{SS}$ to GND	+0.3 V to -25 V
Analog Inputs <sup>1</sup>	$V_{SS} - 0.3\text{ V}$ to $V_{DD} + 0.3\text{ V}$ or 30 mA, whichever occurs first
Digital Inputs <sup>1</sup>	GND - 0.3 V to $V_{DD} + 0.3\text{ V}$ or 30 mA, whichever occurs first
Peak Current, S or D (Pulsed at 1 ms, 10% Duty-Cycle Maximum)	
10-Lead MSOP (4-Layer Board)	300 mA
10-Lead LFCSP	400 mA
Continuous Current per Channel, S or D	Data in Table 4 + 15% mA
Operating Temperature Range Industrial	-40°C to +125°C
Storage Temperature Range	-65°C to +150°C
Junction Temperature	150°C
Reflow Soldering Peak Temperature, Pb Free	260°C

<sup>1</sup> Over voltages 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.

## THERMAL RESISTANCE

Table 6. Thermal Resistance

Package Type	$\theta_{JA}$	$\theta_{JC}$	Unit
10-Lead MSOP (4-Layer Board)	142	44	°C/W
10-Lead LFCSP	76		°C/W

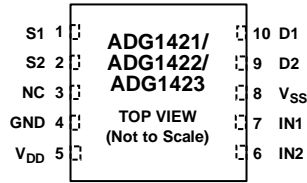
## ESD CAUTION



**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.

# ADG1421/ADG1422/ADG1423

## PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

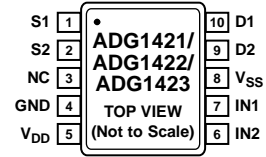


**NOTES**

1. EXPOSED PAD TIED TO SUBSTRATE,  $V_{SS}$ .
2. NC = NO CONNECT

Figure 4. 10-Lead LFCSP Pin Configuration

08487-004



NC = NO CONNECT

Figure 5. 10-Lead MSOP Pin Configuration

08487-005

Table 7. 10-Lead LFCSP Pin Function Descriptions

Pin No.	Mnemonic	Description
1	S1	Source Terminal. This pin can be an input or output.
2	S2	Source Terminal. This pin can be an input or output.
3	NC	No Connect.
4	GND	Ground (0 V) Reference.
5	$V_{DD}$	Most Positive Power Supply Potential.
6	IN2	Logic Control Input.
7	IN1	Logic Control Input.
8	$V_{SS}$	Most Negative Power Supply Potential.
9	D2	Drain Terminal. This pin can be an input or output.
10	D1	Drain Terminal. This pin can be an input or output.
	EPAD	Exposed pad tied to substrate, $V_{SS}$ .

Table 8. 10-Lead MSOP Pin Function Descriptions

Pin No.	Mnemonic	Description
1	S1	Source Terminal. This pin can be an input or output.
2	S2	Source Terminal. This pin can be an input or output.
3	NC	No Connect.
4	GND	Ground (0 V) Reference.
5	$V_{DD}$	Most Positive Power Supply Potential.
6	IN2	Logic Control Input.
7	IN1	Logic Control Input.
8	$V_{SS}$	Most Negative Power Supply Potential.
9	D2	Drain Terminal. This pin can be an input or output.
10	D1	Drain Terminal. This pin can be an input or output.

Table 9. ADG1421/ADG1422 Truth Table

ADG1421 INx	ADG1422 INx	Switch Condition
1	0	On
0	1	Off

Table 10. ADG1423 Truth Table

ADG1423 INx	Switch 1 Condition	Switch 2 Condition
0	Off	On
1	On	Off



TYPICAL PERFORMANCE CHARACTERISTICS

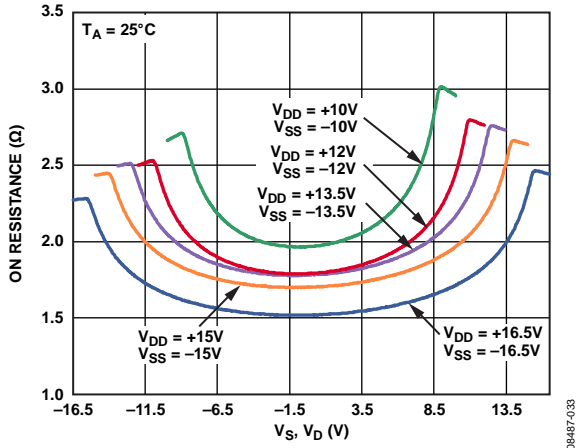


Figure 6. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Dual Supply

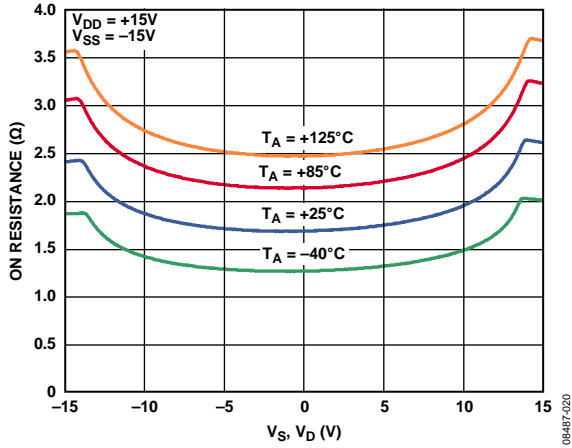


Figure 9. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Different Temperatures,  $\pm 15$  V Dual Supply

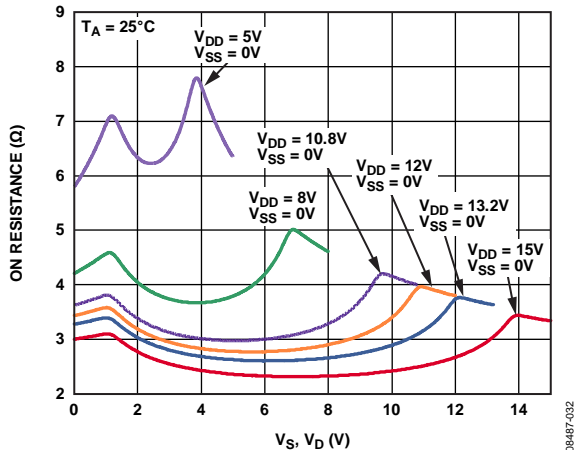


Figure 7. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Single Supply

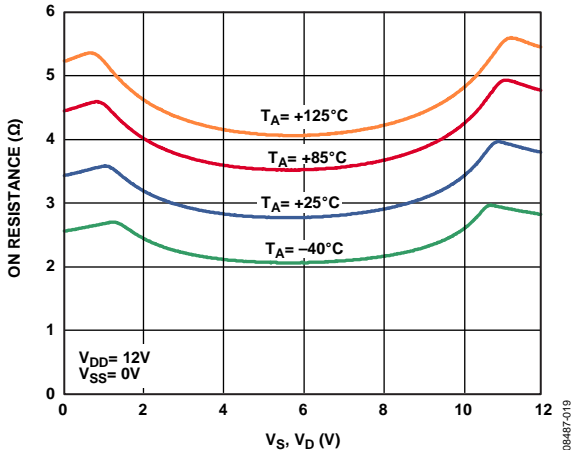


Figure 10. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Different Temperatures, +12 V Single Supply

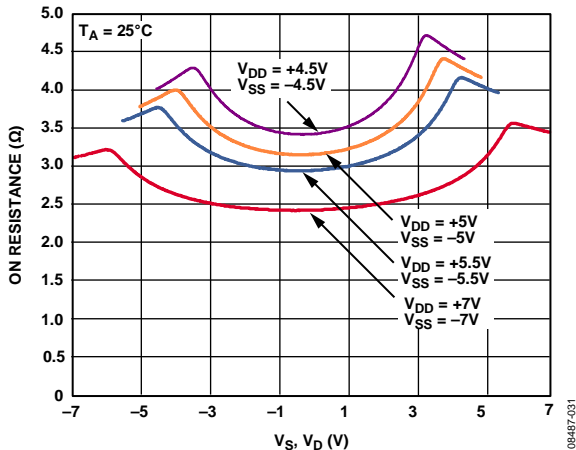


Figure 8. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Dual Supply

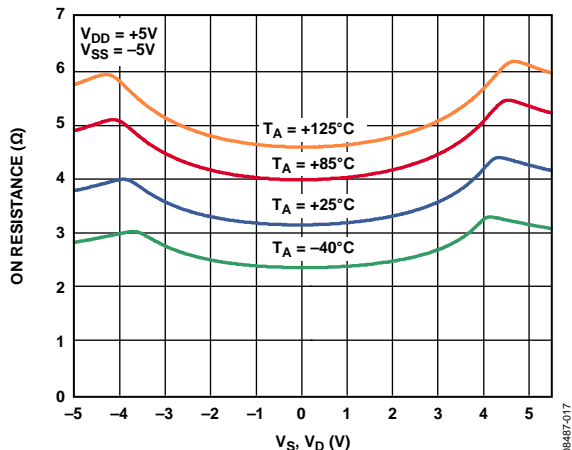


Figure 11. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Different Temperatures,  $\pm 5$  V Dual Supply

# ADG1421/ADG1422/ADG1423

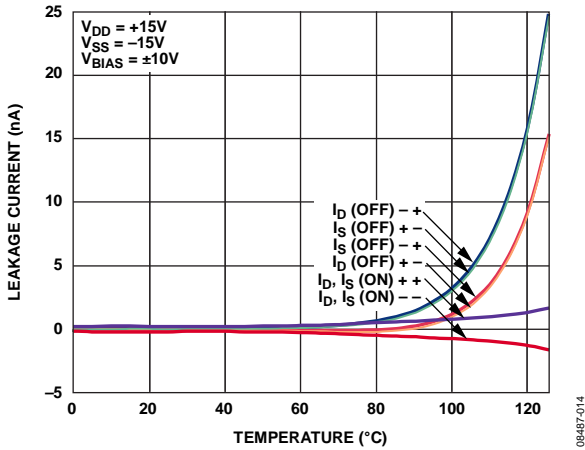


Figure 12. Leakage Currents as a Function of Temperature, ±15 V Dual Supply

08487-014

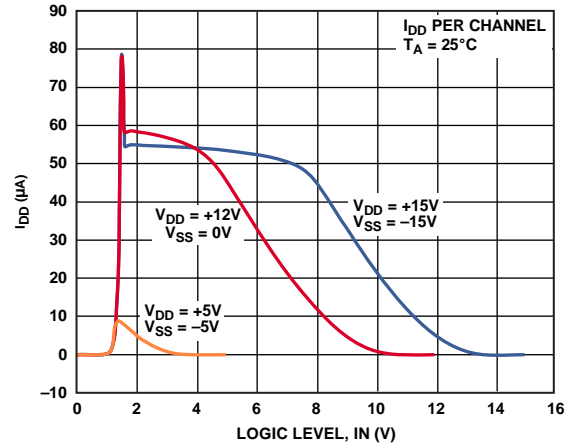


Figure 15.  $I_{DD}$  vs. Logic Level

08487-013

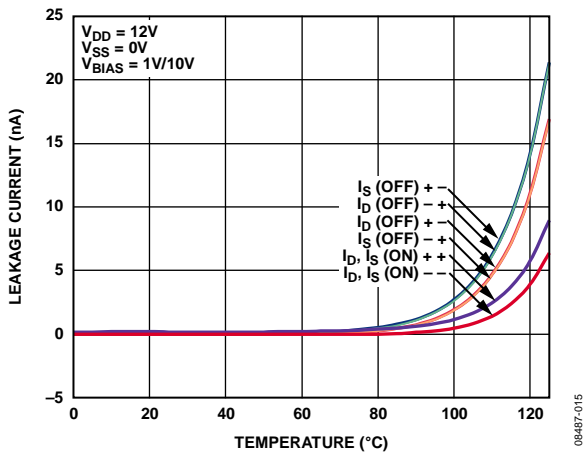


Figure 13. Leakage Currents as a Function of Temperature, +12 V Single Supply

08487-015

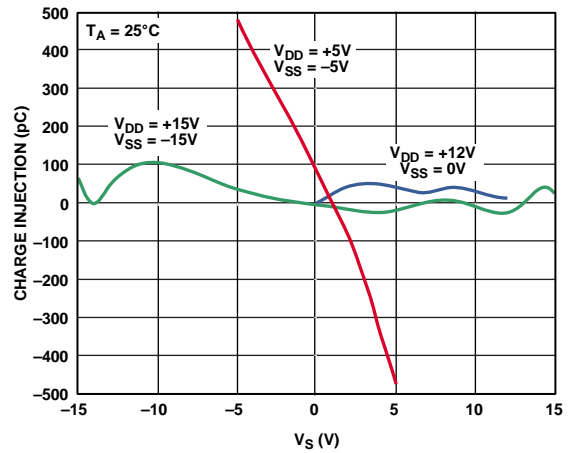


Figure 16. Charge Injection vs. Source Voltage

08487-004

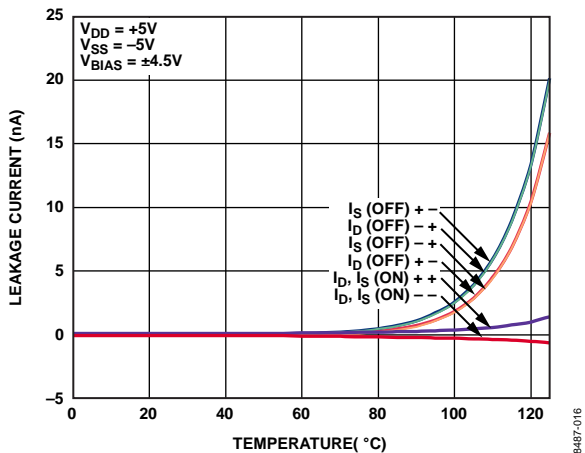


Figure 14. Leakage Currents as a Function of Temperature, ±5 V Dual Supply

08487-016

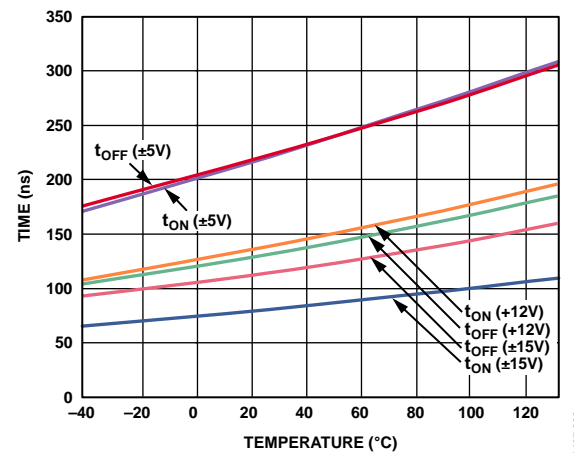


Figure 17.  $t_{TRANSITION}$  Times vs. Temperature

08487-005

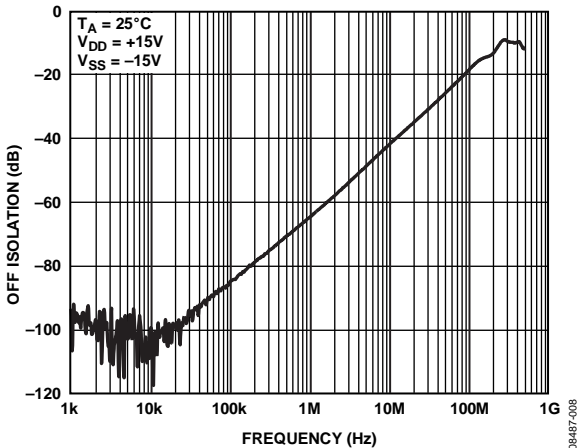


Figure 18. Off Isolation vs. Frequency

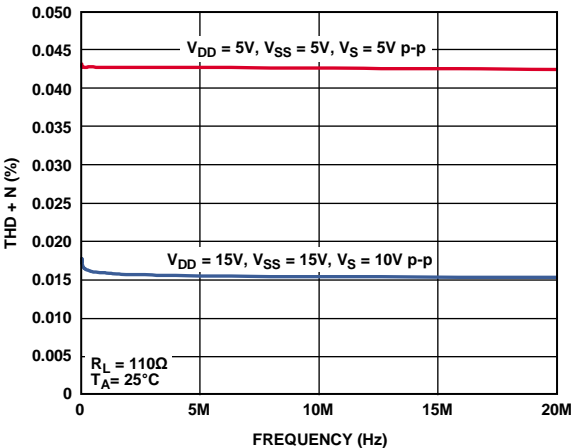


Figure 21. THD + N vs. Frequency

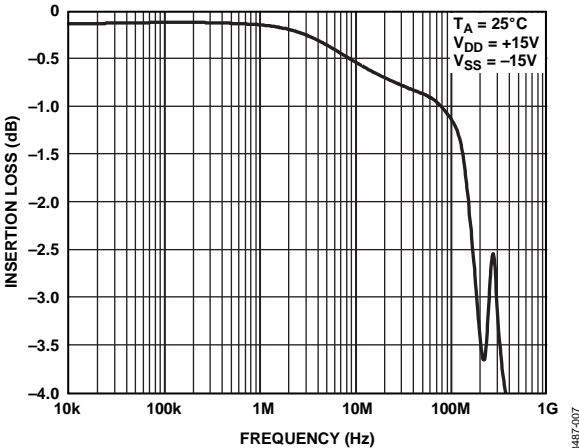


Figure 19. On Response vs. Frequency

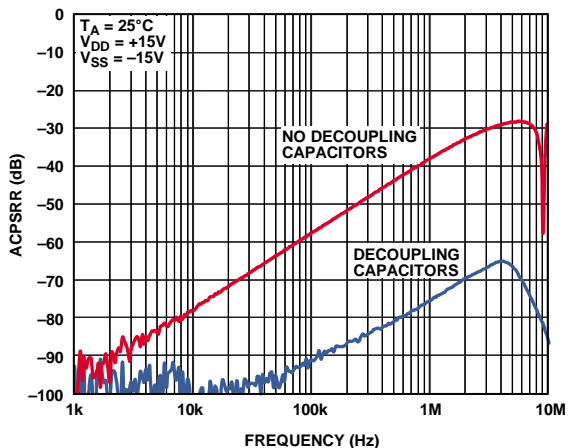


Figure 22. ACPSRR vs. Frequency

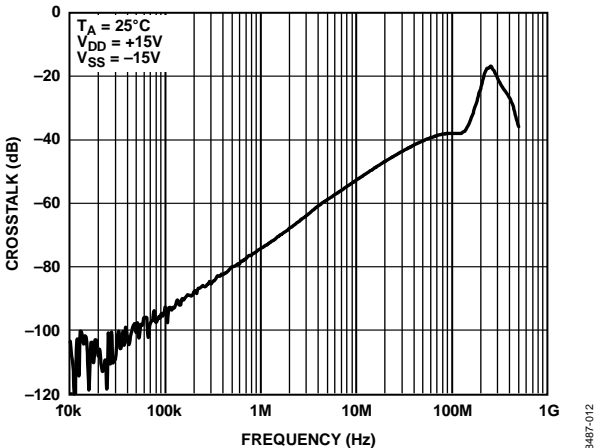


Figure 20. Crosstalk vs. Frequency

# ADG1421/ADG1422/ADG1423

## TEST CIRCUITS

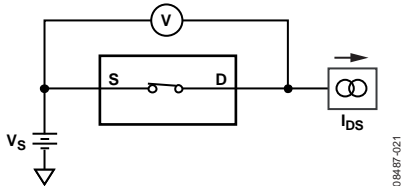


Figure 23. On Resistance

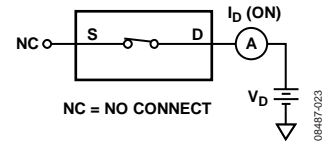


Figure 25. On Leakage

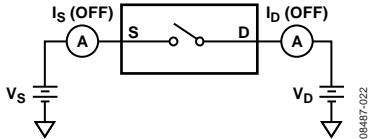


Figure 24. Off Leakage

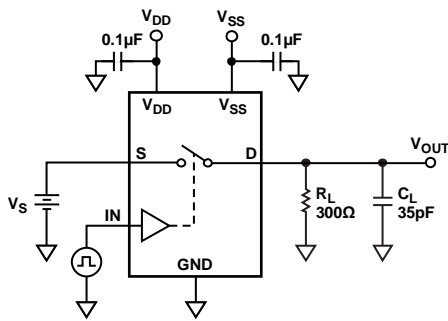


Figure 26. Switching Times

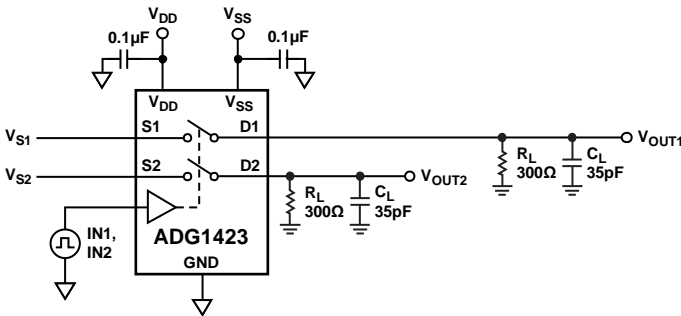
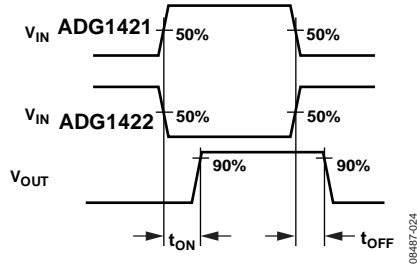


Figure 27. Break-Before-Make Time Delay

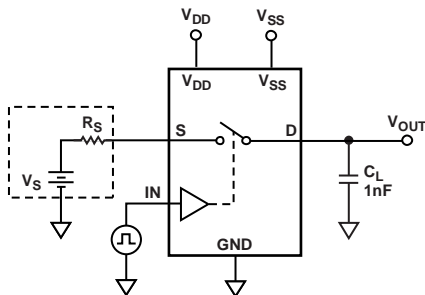
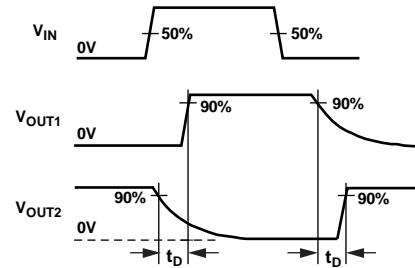
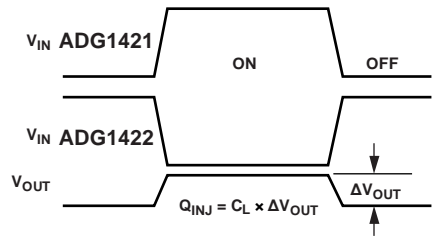
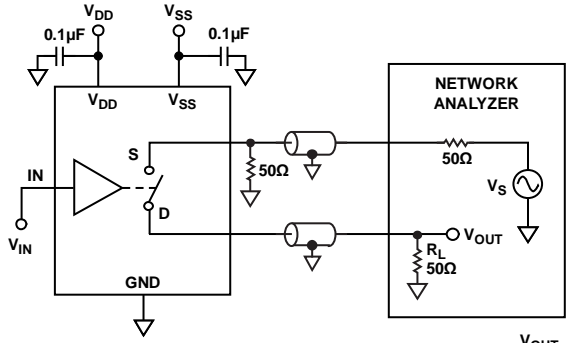


Figure 28. Charge Injection

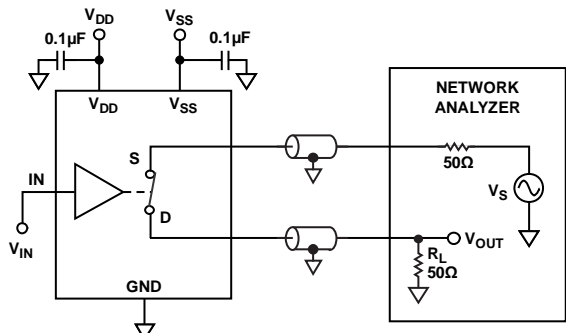




OFF ISOLATION = 20 LOG  $\frac{V_{OUT}}{V_S}$

08487-027

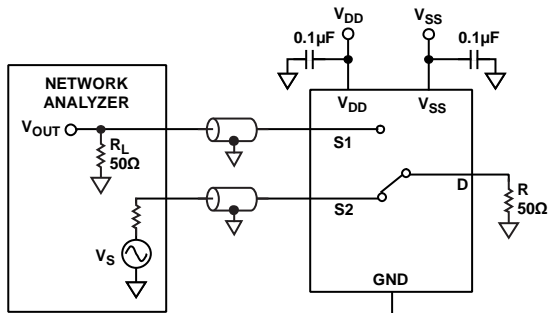
Figure 29. Off Isolation



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

08487-029

Figure 31. Bandwidth



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

08487-028

Figure 30. Channel-to-Channel Crosstalk

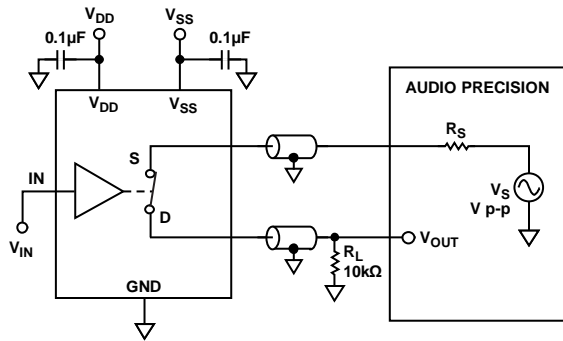


Figure 32. THD + N

08487-030

## TERMINOLOGY

### **I<sub>DD</sub>**

The positive supply current.

### **I<sub>SS</sub>**

The negative supply current.

### **V<sub>D</sub> (V<sub>S</sub>)**

The analog voltage on Terminal D and Terminal S.

### **R<sub>ON</sub>**

The ohmic resistance between Terminal D and Terminal S.

### **R<sub>FLAT (ON)</sub>**

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

### **I<sub>S</sub> (Off)**

The source leakage current with the switch off.

### **I<sub>D</sub> (Off)**

The drain leakage current with the switch off.

### **I<sub>D</sub>, I<sub>S</sub> (On)**

The channel leakage current with the switch on.

### **V<sub>INL</sub>**

The maximum input voltage for Logic 0.

### **V<sub>INH</sub>**

The minimum input voltage for Logic 1.

### **I<sub>INL</sub> (I<sub>INH</sub>)**

The input current of the digital input.

### **C<sub>S</sub> (Off)**

The off switch source capacitance, measured with reference to ground.

### **C<sub>D</sub> (Off)**

The off switch drain capacitance, measured with reference to ground.

### **C<sub>D</sub>, C<sub>S</sub> (On)**

The on switch capacitance, measured with reference to ground.

### **C<sub>IN</sub>**

The digital input capacitance.

### **t<sub>ON</sub> (EN)**

Delay time between the 50% and 90% points of the digital input and switch on condition. See Figure 26.

### **t<sub>OFF</sub> (EN)**

Delay time between the 50% and 90% points of the digital input and switch off condition. See Figure 26.

### **t<sub>TRANSITION</sub>**

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

### **T<sub>BBM</sub>**

Off time measured between the 80% point of both switches when switching from one address state to another. See Figure 27.

### **Charge Injection**

A measure of the glitch impulse transferred from the digital input to the analog output during switching. See Figure 28.

### **Off Isolation**

A measure of unwanted signal coupling through an off switch. See Figure 29.

### **Crosstalk**

A measure of unwanted signal that is coupled through from one channel to another as a result of parasitic capacitance. See Figure 30.

### **Bandwidth**

The frequency at which the output is attenuated by 3 dB. See Figure 31.

### **On Response**

The frequency response of the on switch.

### **Insertion Loss**

The loss due to the on resistance of the switch. See Figure 31.

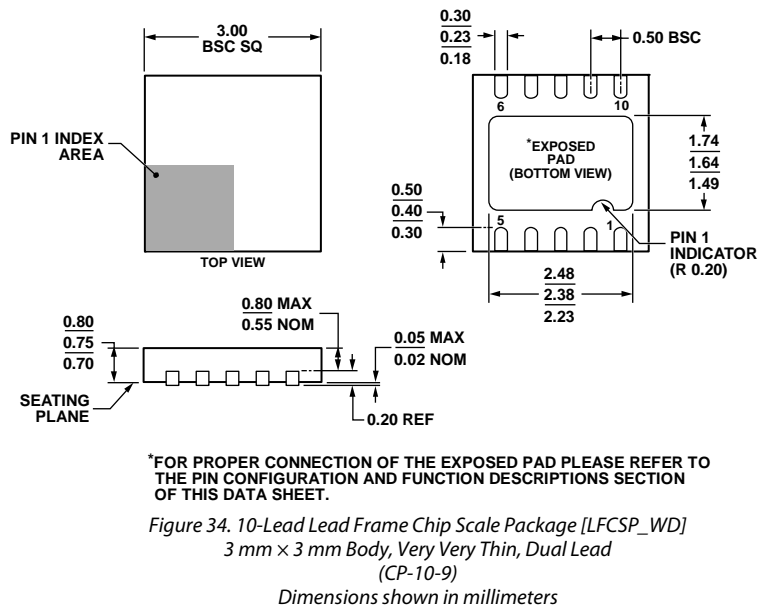
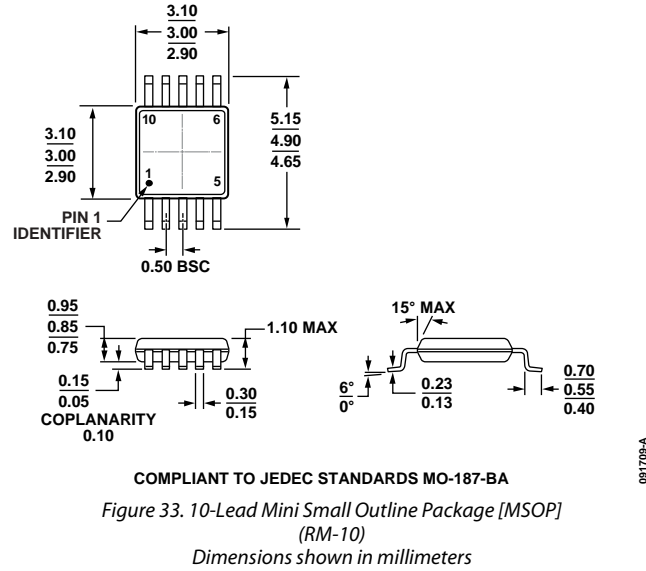
### **THD + N**

The ratio of the harmonic amplitude plus noise of the signal to the fundamental. See Figure 32.

### **AC Power Supply Rejection Ratio (ACPSRR)**

ACPSRR measures the ability of a part to avoid coupling noise and spurious signals that appear on the supply voltage pin to the output of the switch. The dc voltage on the device is modulated by a sine wave of 0.62 V p-p. The ratio of the amplitude of signal on the output to the amplitude of the modulation is the ACPSRR. See Figure 22.

# OUTLINE DIMENSIONS



## ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Branding
ADG1421BRMZ <sup>1</sup>	-40°C to +125°C	10-Lead Mini Small Outline Package [MSOP]	RM-10	S2V
ADG1421BRMZ-REEL7 <sup>1</sup>	-40°C to +125°C	10-Lead Mini Small Outline Package [MSOP]	RM-10	S2V
ADG1421BCPZ-REEL7 <sup>1</sup>	-40°C to +125°C	10-Lead Frame Chip Scale Package [LFCSP_WD]	CP-10-9	S2V
ADG1422BRMZ <sup>1</sup>	-40°C to +125°C	10-Lead Mini Small Outline Package [MSOP]	RM-10	S2W
ADG1422BRMZ-REEL7 <sup>1</sup>	-40°C to +125°C	10-Lead Mini Small Outline Package [MSOP]	RM-10	S2W
ADG1422BCPZ-REEL7 <sup>1</sup>	-40°C to +125°C	10-Lead Frame Chip Scale Package [LFCSP_WD]	CP-10-9	S2W
ADG1423BRMZ <sup>1</sup>	-40°C to +125°C	10-Lead Mini Small Outline Package [MSOP]	RM-10	S2X
ADG1423BRMZ-REEL7 <sup>1</sup>	-40°C to +125°C	10-Lead Mini Small Outline Package [MSOP]	RM-10	S2X
ADG1423BCPZ-REEL7 <sup>1</sup>	-40°C to +125°C	10-Lead Frame Chip Scale Package [LFCSP_WD]	CP-10-9	S2X

<sup>1</sup> Z = RoHS Compliant Part.

**ADG1421/ADG1422/ADG1423**

## **NOTES**