High Voltage Latch-Up Proof, Quad SPST Switches

Data Sheet

ADG5412W

FEATURES

- Qualified for automotive applications
- Latch-up proof
- 8 kV human body model (HBM) ESD rating
- Low on resistance (<10 Ω)
- ±9 V to ±22 V dual-supply operation
- 9 V to 40 V single-supply operation
- 48 V supply maximum ratings
- Fully specified at ±15 V, ±20 V, +12 V, and +36 V
- V_{SS} to V_{DD} analog signal range

APPLICATIONS

- Relay replacement
- Automatic test equipment
- Data acquisition
- Instrumentation
- Avionics
- Audio and video switching
- Communication systems

FUNCTIONAL BLOCK DIAGRAM

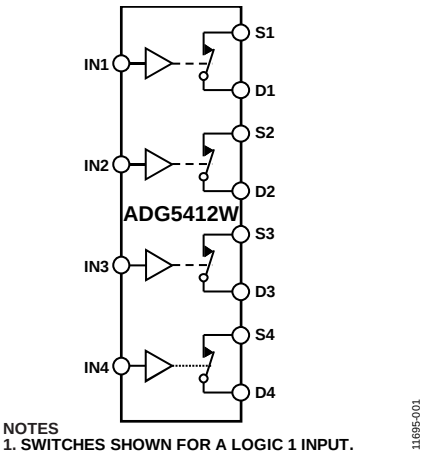

Figure 1.

GENERAL DESCRIPTION

The ADG5412W contains four independent single-pole/single-throw (SPST) switches. The ADG5412W switches turn on with Logic 1. Each switch conducts equally well in both directions when on, and each switch has an input signal range that extends to the supplies. In the off condition, signal levels up to the supplies are blocked.

The ADG5412W does not have a V_L pin. The digital inputs are compatible with 3 V logic inputs over the full operating supply range.

The on-resistance profile is very flat over the full analog input range, which ensures good linearity and low distortion when switching audio signals. High switching speed also makes the devices suitable for video signal switching.

PRODUCT HIGHLIGHTS

1. Trench isolation guards against latch-up. A dielectric trench separates the P and N channel transistors thereby preventing latch-up even under severe overvoltage conditions.
2. Low R_{ON}.
3. Dual-supply operation. For applications where the analog signal is bipolar, the ADG5412W can be operated from dual supplies up to ±22 V.
4. Single-supply operation. For applications where the analog signal is unipolar, the ADG5412W can be operated from a single rail power supply up to 40 V.
5. 3 V logic compatible digital inputs: V_{INH} = 2.0 V, V_{INL} = 0.8 V.
6. No V_L logic power supply required.

Rev. A

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REVISION HISTORY

3/14—Rev. 0 to Rev. A
Added TSSOP (RU-16) Model ... Universal

12/13—Revision 0: Initial Version

SPECIFICATIONS

±15 V DUAL SUPPLY

V_{DD} = +15 V ± 10%, V_{SS} = −15 V ± 10%, GND = 0 V, T_A = −40°C to +125°C, unless otherwise noted.

Table 1.

Parameter	Min	Typ (T_A = 25°C)	Max	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			V_{DD} to V_{SS}	V	
On Resistance, R_{ON}		9.8	16	Ω	V_{DD} = +13.5 V, V_{SS} = −13.5 V, V_S = ±10 V, I_S = −10 mA; see Figure 24
On-Resistance Match Between Channels, ΔR_{ON}		0.35	1.1	Ω	V_S = ±10 V, I_S = −10 mA
On-Resistance Flatness, $R_{FLAT (ON)}$		1.2	2.2	Ω	V_S = ±10 V, I_S = −10 mA
LEAKAGE CURRENTS					V_{DD} = +16.5 V, V_{SS} = −16.5 V
Source Off Leakage, I_S (Off)		±0.05	±10	nA	V_S = ±10 V, V_D = ∓10 V; see Figure 27
Drain Off Leakage, I_D (Off)		±0.05	±10	nA	V_S = ±10 V, V_D = ∓10 V; see Figure 27
Channel On Leakage, I_D (On), I_S (On)		±0.1	±20	nA	V_S = V_D = ±10 V; see Figure 23
DIGITAL INPUTS					
Input High Voltage, V_{INH}	2.0			V	
Input Low Voltage, V_{INL}			0.8	V	
Input Current, I_{INL} or I_{INH}		0.002	±0.1	μA	V_{IN} = V_{GND} or V_{DD}
Digital Input Capacitance, C_{IN}		2.5		pF	
DYNAMIC CHARACTERISTICS[1]					
t_{ON}		170	262	ns	V_S = 10 V; see Figure 30, R_L = 300 Ω, C_L = 35 pF
t_{OFF}		120	182	ns	V_S = 10 V; see Figure 30, R_L = 300 Ω, C_L = 35 pF
Charge Injection, Q_{INJ}		240		pC	V_S = 0 V, R_S = 0 Ω, C_L = 1 nF; see Figure 31
Off Isolation		−78		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 26
Channel-to-Channel Crosstalk		−70		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 25
Total Harmonic Distortion + Noise		0.009		%	R_L = 1 kΩ, 15 V p-p, f = 20 Hz to 20 kHz; see Figure 28
−3 dB Bandwidth		167		MHz	R_L = 50 Ω, C_L = 5 pF; see Figure 29
Insertion Loss		−0.7		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 29
C_S (Off)		18		pF	V_S = 0 V, f = 1 MHz
C_D (Off)		18		pF	V_S = 0 V, f = 1 MHz
C_D (On), C_S (On)		60		pF	V_S = 0 V, f = 1 MHz
POWER REQUIREMENTS					V_{DD} = +16.5 V, V_{SS} = −16.5 V
I_{DD}		45	70	μA	Digital inputs = 0 V or V_{DD}
I_{SS}		0.001	1	μA	Digital inputs = 0 V or V_{DD}
V_{DD}/V_{SS}	±9		±22	V	GND = 0 V

[1] Guaranteed by design; not subject to production test.

±20 V DUAL SUPPLY

V_{DD} = +20 V ± 10%, V_{SS} = −20 V ± 10%, GND = 0 V, T_A = −40°C to +125°C, unless otherwise noted.

Table 2.

Parameter	Min	Typ (T_A = 25°C)	Max	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			V_{DD} to V_{SS}	V	
On Resistance, R_{ON}		9	15	Ω	V_{DD} = +18 V, V_{SS} = −18 V, V_S = ±15 V, I_S = −10 mA; see Figure 24
On-Resistance Match Between Channels, ΔR_{ON}		0.35	1.1	Ω	V_S = ±15 V, I_S = −10 mA
On-Resistance Flatness, $R_{FLAT (ON)}$		1.5	2.5	Ω	V_S = ±15 V, I_S = −10 mA
LEAKAGE CURRENTS					V_{DD} = +22 V, V_{SS} = −22 V
Source Off Leakage, I_S (Off)		±0.05	±10	nA	V_S = ±15 V, V_D = ∓15 V; see Figure 27
Drain Off Leakage, I_D (Off)		±0.05	±10	nA	V_S = ±15 V, V_D = ∓15 V; see Figure 27
Channel On Leakage, I_D (On), I_S (On)		±0.1	±20	nA	V_S = V_D = ±15 V; see Figure 23
DIGITAL INPUTS					
Input High Voltage, V_{INH}	2.0			V	
Input Low Voltage, V_{INL}			0.8	V	
Input Current, I_{INL} or I_{INH}		0.002		μA	V_{IN} = V_{GND} or V_{DD}
			±0.1	μA	
Digital Input Capacitance, C_{IN}		2.5		pF	
DYNAMIC CHARACTERISTICS[1]					
t_{ON}		158	240	ns	V_S = 10 V; see Figure 30, R_L = 300 Ω, C_L = 35 pF
t_{OFF}		110	170	ns	V_S = 10 V; see Figure 30, R_L = 300 Ω, C_L = 35 pF
Charge Injection, Q_{INJ}		310		pC	V_S = 0 V, R_S = 0 Ω, C_L = 1 nF; see Figure 31
Off Isolation		−78		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 26
Channel-to-Channel Crosstalk		−70		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 25
Total Harmonic Distortion + Noise		0.007		%	R_L = 1 kΩ, 20 V p-p, f = 20 Hz to 20 kHz; see Figure 28
−3 dB Bandwidth		160		MHz	R_L = 50 Ω, C_L = 5 pF; see Figure 29
Insertion Loss		−0.6		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 29
C_S (Off)		17		pF	V_S = 0 V, f = 1 MHz
C_D (Off)		17		pF	V_S = 0 V, f = 1 MHz
C_D (On), C_S (On)		60		pF	V_S = 0 V, f = 1 MHz
POWER REQUIREMENTS					V_{DD} = +22 V, V_{SS} = −22 V
I_{DD}		50	110	μA	Digital inputs = 0 V or V_{DD}
I_{SS}		0.001	1	μA	Digital inputs = 0 V or V_{DD}
V_{DD}/V_{SS}	±9		±22	V	GND = 0 V

[1] Guaranteed by design; not subject to production test.

12 V SINGLE SUPPLY

V_{DD} = 12 V ± 10%, V_{SS} = 0 V, GND = 0 V, T_A = −40°C to +125°C, unless otherwise noted.

Table 3.

Parameter	Min	Typ (T_A = 25°C)	Max	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 V to V_{DD}	V	
On Resistance, R_{ON}		19	31	Ω	V_{DD} = 10.8 V, V_{SS} = 0 V, V_S = 0 V to 10 V, I_S = −10 mA; see Figure 24
On-Resistance Match Between Channels, ΔR_{ON}		0.4	1.2	Ω	V_S = 0 V to 10 V, I_S = −10 mA
On-Resistance Flatness, $R_{FLAT (ON)}$		4.4	7.5	Ω	V_S = 0 V to 10 V, I_S = −10 mA
LEAKAGE CURRENTS					V_{DD} = 13.2 V, V_{SS} = 0 V
Source Off Leakage, I_S (Off)		±0.05	±10	nA	V_S = 1 V/10 V, V_D = 10 V/1 V; see Figure 27
Drain Off Leakage, I_D (Off)		±0.05	±10	nA	V_S = 1 V/10 V, V_D = 10 V/1 V; see Figure 27
Channel On Leakage, I_D (On), I_S (On)		±0.1	±20	nA	V_S = V_D = 1 V/10 V; see Figure 23
DIGITAL INPUTS					
Input High Voltage, V_{INH}	2.0			V	
Input Low Voltage, V_{INL}			0.8	V	
Input Current, I_{INL} or I_{INH}		0.002		μA	V_{IN} = V_{GND} or V_{DD}
			±0.1	μA	
Digital Input Capacitance, C_{IN}		2.5		pF	
DYNAMIC CHARACTERISTICS[1]					
t_{ON}		225	403	ns	V_S = 8 V; see Figure 30, R_L = 300 Ω, C_L = 35 pF
t_{OFF}		150	247	ns	V_S = 8 V; see Figure 30, R_L = 300 Ω, C_L = 35 pF
Charge Injection, Q_{INJ}		95		pC	V_S = 6 V, R_S = 0 Ω, C_L = 1 nF; see Figure 31
Off Isolation		−78		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 26
Channel-to-Channel Crosstalk		−70		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 25
Total Harmonic Distortion + Noise		0.07		%	R_L = 1 kΩ, 6 V p-p, f = 20 Hz to 20 kHz; see Figure 28
−3 dB Bandwidth		180		MHz	R_L = 50 Ω, C_L = 5 pF; see Figure 29
Insertion Loss		−1.3		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 29
C_S (Off)		22		pF	V_S = 6 V, f = 1 MHz
C_D (Off)		22		pF	V_S = 6 V, f = 1 MHz
C_D (On), C_S (On)		58		pF	V_S = 6 V, f = 1 MHz
POWER REQUIREMENTS					V_{DD} = 13.2 V
I_{DD}		40	65	μA	Digital inputs = 0 V or V_{DD}
V_{DD}	9		40	V	GND = 0 V, V_{SS} = 0 V

[1] Guaranteed by design; not subject to production test.

36 V SINGLE SUPPLY

V_{DD} = 36 V ± 10%, V_{SS} = 0 V, GND = 0 V, T_A = −40°C to +125°C, unless otherwise noted.

Table 4.

Parameter	Min	Typ (T_A = 25°C)	Max	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 V to V_{DD}	V	
On Resistance, R_{ON}		10.6	17	Ω	V_{DD} = 32.4 V, V_{SS} = 0 V , V_S = 0 V to 30 V, I_S = −10 mA; see Figure 24
On-Resistance Match Between Channels, ΔR_{ON}		0.35	1.1	Ω	V_S = 0 V to 30 V, I_S = −10 mA
On-Resistance Flatness, $R_{FLAT(ON)}$		2.7	4.5	Ω	V_S = 0 V to 30 V, I_S = −10 mA
LEAKAGE CURRENTS					V_{DD} = 39.6 V, V_{SS} = 0 V
Source Off Leakage, I_S (Off)		±0.05	±10	nA	V_S = 1 V/30 V, V_D = 30 V/1 V; see Figure 27
Drain Off Leakage, I_D (Off)		±0.05	±10	nA	V_S = 1 V/30 V, V_D = 30 V/1 V; see Figure 27
Channel On Leakage, I_D (On), I_S (On)		±0.1	±20	nA	V_S = V_D = 1 V/30 V; see Figure 23
DIGITAL INPUTS					
Input High Voltage, V_{INH}	2.0			V	
Input Low Voltage, V_{INL}			0.8	V	
Input Current, I_{INL} or I_{INH}		0.002	±0.1	µA	V_{IN} = V_{GND} or V_{DD}
Digital Input Capacitance, C_{IN}		2.5		pF	
DYNAMIC CHARACTERISTICS[1]					
t_{ON}		180	248	ns	V_S = 18 V; see Figure 30, R_L = 300 Ω, C_L = 35 pF
t_{OFF}		130	174	ns	V_S = 18 V; see Figure 30, R_L = 300 Ω, C_L = 35 pF
Charge Injection, Q_{INJ}		280		pC	V_S = 18 V, R_S = 0 Ω, C_L = 1 nF; see Figure 31
Off Isolation		−78		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 26
Channel-to-Channel Crosstalk		−70		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; Figure 25
Total Harmonic Distortion + Noise		0.03		%	R_L = 1 kΩ, 18 V p-p, f = 20 Hz to 20 kHz; see Figure 28
−3 dB Bandwidth		174		MHz	R_L = 50 Ω, C_L = 5 pF; see Figure 29
Insertion Loss		−0.8		dB	R_L = 50 Ω, C_L = 5 pF, f = 1 MHz; see Figure 29
C_S (Off)		18		pF	V_S = 18 V, f = 1 MHz
C_D (Off)		18		pF	V_S = 18 V, f = 1 MHz
C_D (On), C_S (On)		58		pF	V_S = 18 V, f = 1 MHz
POWER REQUIREMENTS					V_{DD} = 39.6 V
I_{DD}		80		µA	Digital inputs = 0 V or V_{DD}
		100	130	µA	
V_{DD}	9		40	V	GND = 0 V, V_{SS} = 0 V

[1] Guaranteed by design; not subject to production test.

CONTINUOUS CURRENT PER CHANNEL, Sx OR Dx

Table 5.

Parameter	25°C	85°C	125°C	Unit
CONTINUOUS CURRENT, Sx OR Dx				
V_{DD} = +15 V, V_{SS} = −15 V				
TSSOP (θ_{JA} = 112.6°C/W)	89	59	37	mA maximum
LFCSP (θ_{JA} = 30.4°C/W)	160	94	49	mA maximum
V_{DD} = +20 V, V_{SS} = −20 V				
TSSOP (θ_{JA} = 112.6°C/W)	95	63	39	mA maximum
LFCSP (θ_{JA} = 30.4°C/W)	170	98	50	mA maximum
V_{DD} = 12 V, V_{SS} = 0 V				
TSSOP (θ_{JA} = 112.6°C/W)	61	43	29	mA maximum
LFCSP (θ_{JA} = 30.4°C/W)	110	70	42	mA maximum
V_{DD} = 36 V, V_{SS} = 0 V				
TSSOP (θ_{JA} = 112.6°C/W)	80	54	35	mA maximum
LFCSP (θ_{JA} = 30.4°C/W)	144	87	47	mA maximum

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted.

Table 6.

Parameter	Rating
V_{DD} to V_{SS}	48 V
V_{DD} to GND	−0.3 V to +48 V
V_{SS} to GND	+0.3 V to −48 V
Analog Inputs[1]	V_{SS} − 0.3 V to V_{DD} + 0.3 V or 30 mA, whichever occurs first
Digital Inputs[1]	V_{SS} − 0.3 V to V_{DD} + 0.3 V or 30 mA, whichever occurs first
Peak Current, Sx or Dx Pins	278 mA (pulsed at 1 ms, 10% duty cycle maximum)
Continuous Current, Sx or Dx[2]	Data + 15%
Temperature Range	
Operating	−40°C to +125°C
Storage	−65°C to +150°C
Junction Temperature	150°C
Thermal Impedance, θ_{JA}	
16-Lead TSSOP (4-Layer Board)	112.6°C/W
16-Lead LFCSP (4-Layer Board)	30.4°C/W
Reflow Soldering Peak Temperature, Pb Free	As per JEDEC J-STD-020

[1] Overvoltages at the INx, Sx, and Dx pins are clamped by internal diodes. Limit current to the maximum ratings given.
[2] See Table 5.

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.

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.

PIN CONFIGURATIONS AND FUNCTION DESCRIPTIONS

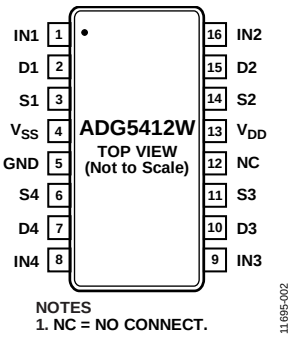

Figure 2. TSSOP Pin Configuration

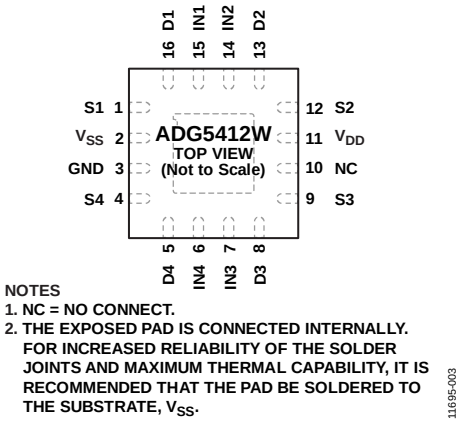

Figure 3. LFCSP Pin Configuration

Table 7. Pin Function Descriptions

Pin No.			
TSSOP	**LFCSP**	**Mnemonic**	**Description**
1	15	IN1	Logic Control Input 1.
2	16	D1	Drain Terminal 1. This pin can be an input or output.
3	1	S1	Source Terminal 1. This pin can be an input or output.
4	2	V_{SS}	Most Negative Power Supply Potential.
5	3	GND	Ground (0 V) Reference.
6	4	S4	Source Terminal 4. This pin can be an input or output.
7	5	D4	Drain Terminal 4. This pin can be an input or output.
8	6	IN4	Logic Control Input 4.
9	7	IN3	Logic Control Input 3.
10	8	D3	Drain Terminal 3. This pin can be an input or output.
11	9	S3	Source Terminal 3. This pin can be an input or output.
12	10	NC	No Connection.
13	11	V_{DD}	Most Positive Power Supply Potential.
14	12	S2	Source Terminal 2. This pin can be an input or output.
15	13	D2	Drain Terminal 2. This pin can be an input or output.
16	14	IN2	Logic Control Input 2.
	EP	Exposed Pad	The exposed pad is connected internally. For increased reliability of the solder joints and maximum thermal capability, it is recommended that the pad be soldered to the substrate, V_{SS}.

Table 8. ADG5412W Truth Table

INx	Switch Condition
1	On
0	Off

TYPICAL PERFORMANCE CHARACTERISTICS

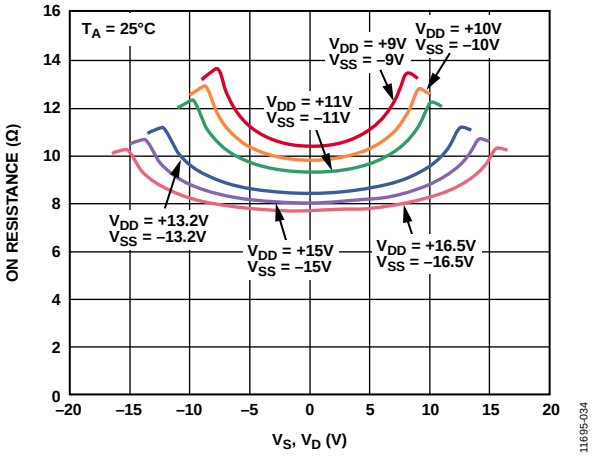

Figure 4. R_{ON} as a Function of V_S, V_D (Dual Supply)

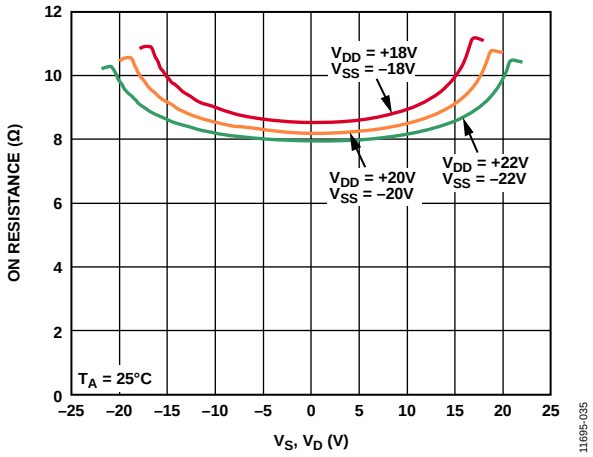

Figure 5. R_{ON} as a Function of V_S, V_D (Dual Supply)

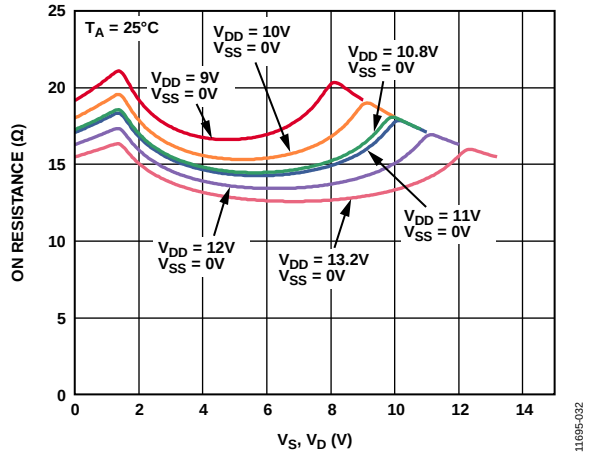

Figure 6. R_{ON} as a Function of V_S, V_D (Single Supply)

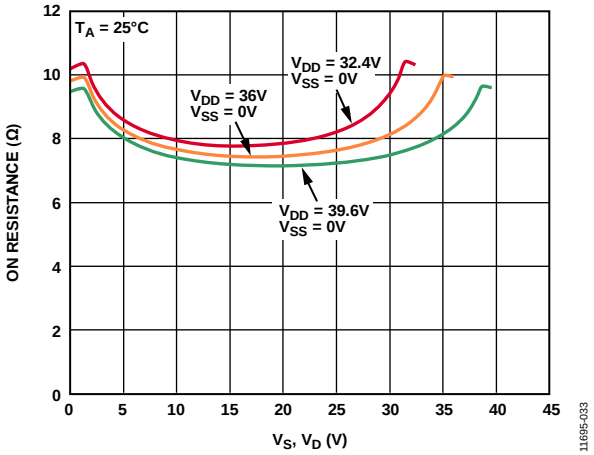

Figure 7. R_{ON} as a Function of V_S, V_D (Single Supply)

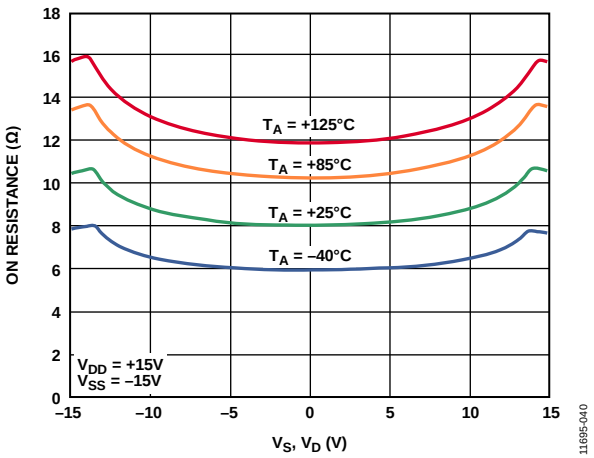

Figure 8. R_{ON} as a Function of V_S (V_D) for Different Temperatures, ±15 V Dual Supply

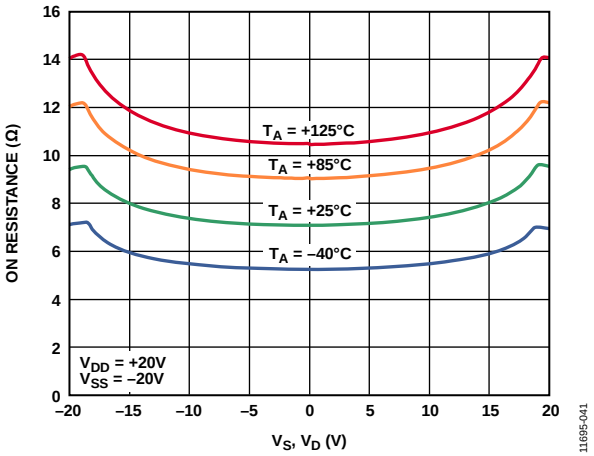

Figure 9. R_{ON} as a Function of V_S (V_D) for Different Temperatures, ±20 V Dual Supply

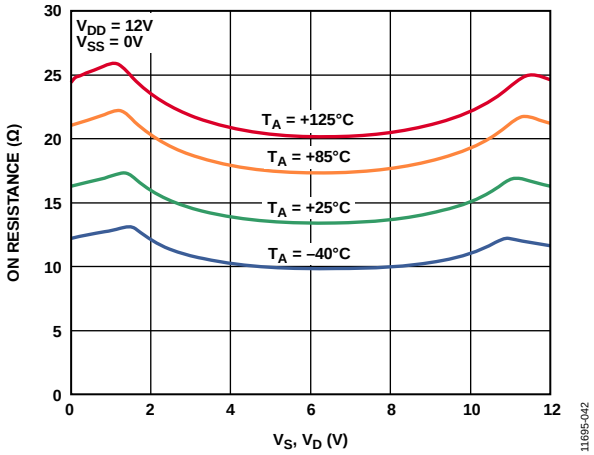

Figure 10. R_{ON} as a Function of V_S (V_D) for Different Temperatures, 12 V Single Supply

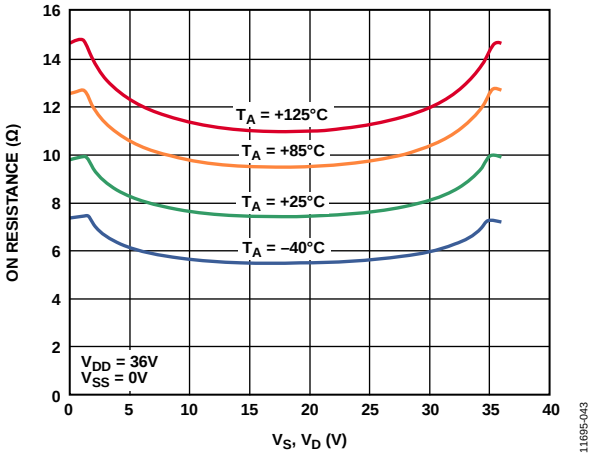

Figure 11. R_{ON} as a Function of V_S (V_D) for Different Temperatures, 36 V Single Supply

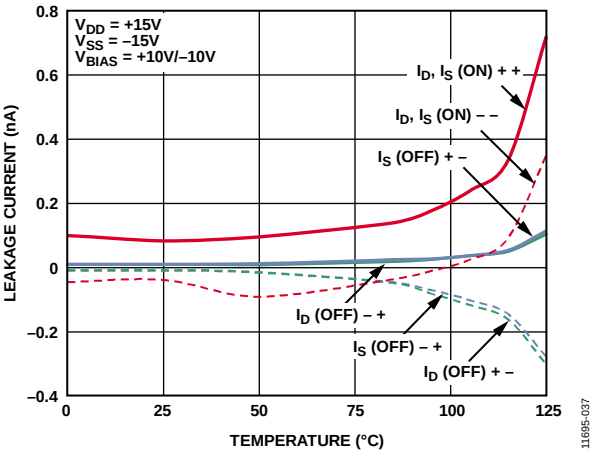

Figure 12. Leakage Currents vs. Temperature, ±15 V Dual Supply

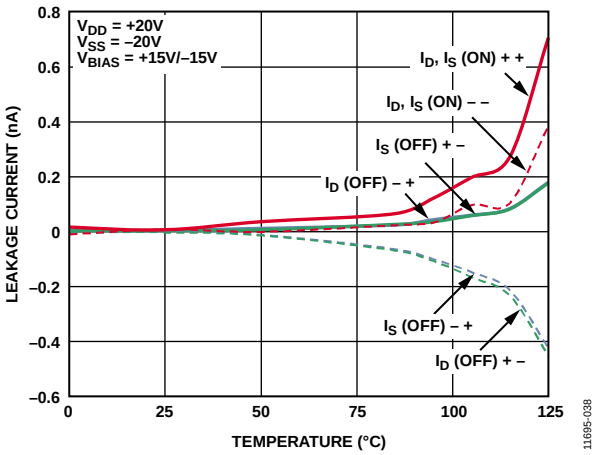

Figure 13. Leakage Currents vs. Temperature, ±20 V Dual Supply

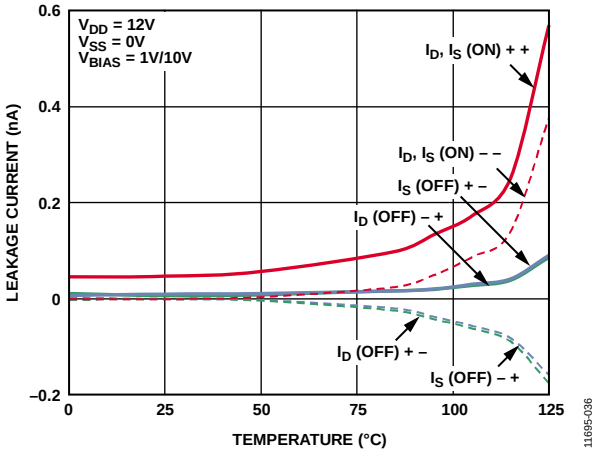

Figure 14. Leakage Currents vs. Temperature, 12 V Single Supply

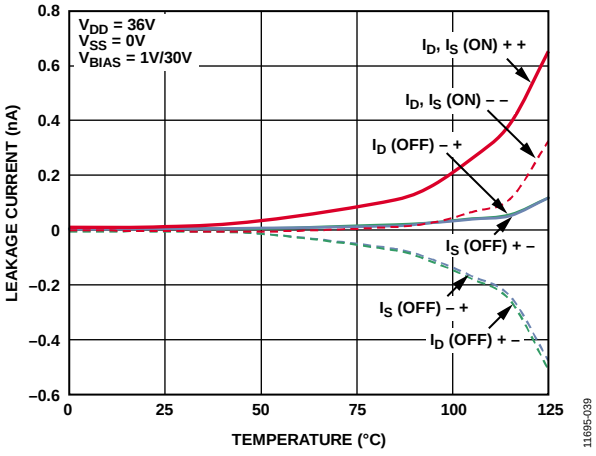

Figure 15. Leakage Currents vs. Temperature, 36 V Single Supply

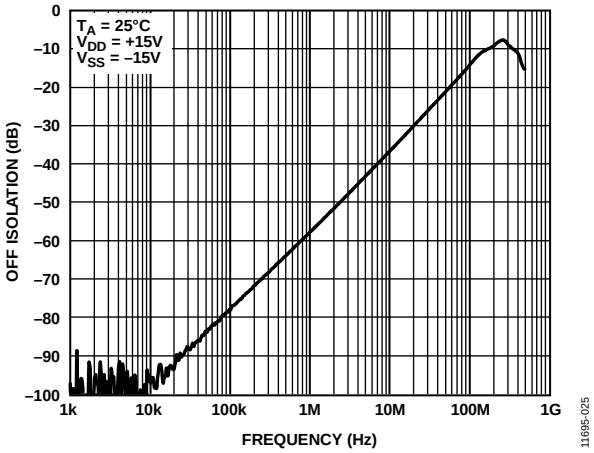

Figure 16. Off Isolation vs. Frequency, ±15 V Dual Supply

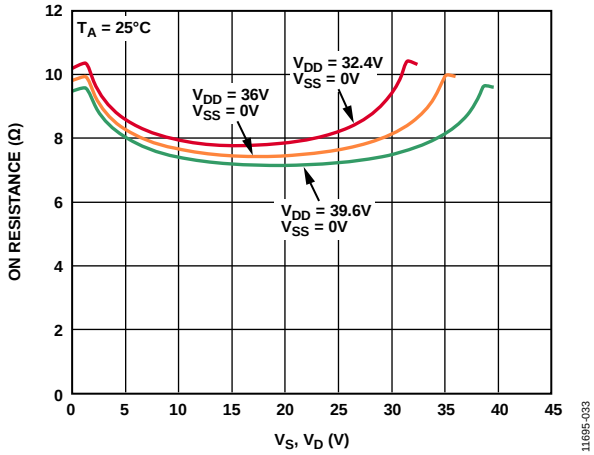

Figure 17. Crosstalk vs. Frequency, ±15 V Dual Supply

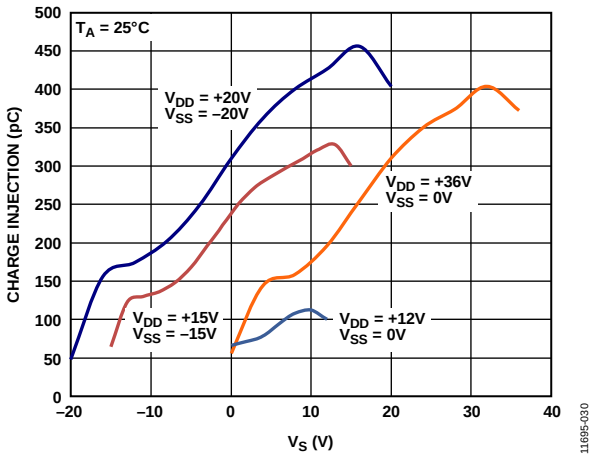

Figure 18. Charge Injection vs. Source Voltage

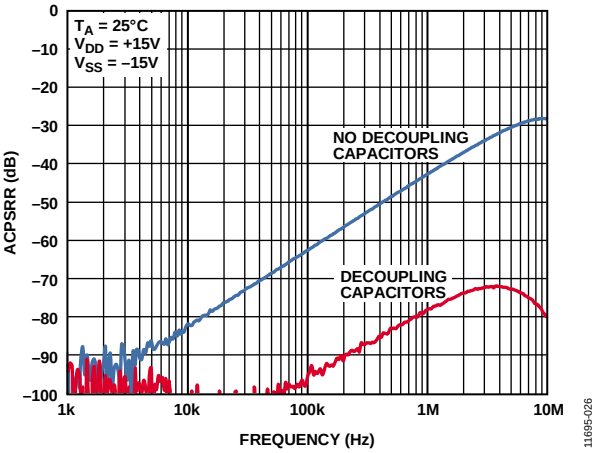

Figure 19. ACPSRR vs. Frequency, ±15 V Dual Supply

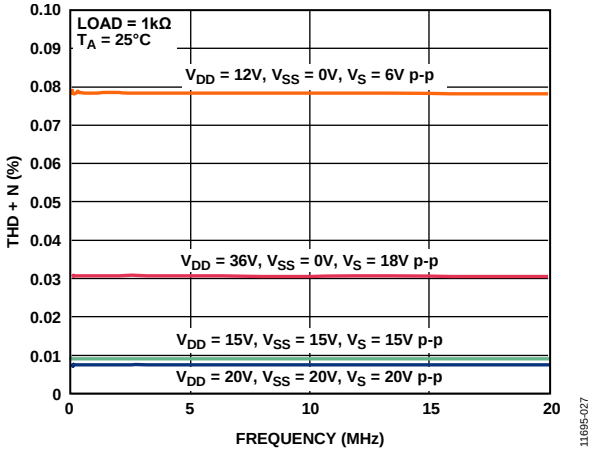

Figure 20. THD + N vs. Frequency, ±15 V Dual Supply

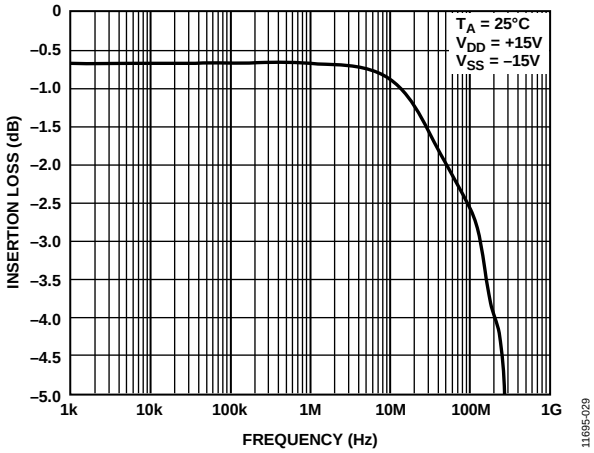

Figure 21. Bandwidth

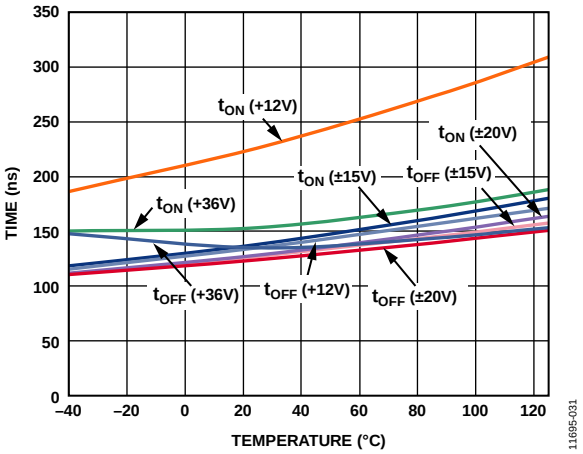

Figure 22. t_{ON}, t_{OFF} Times vs. Temperature

TEST CIRCUITS

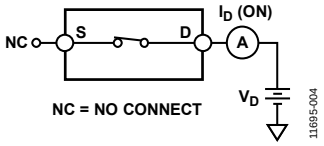

Figure 23. On Leakage

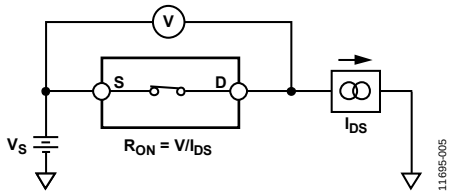

Figure 24. On Resistance

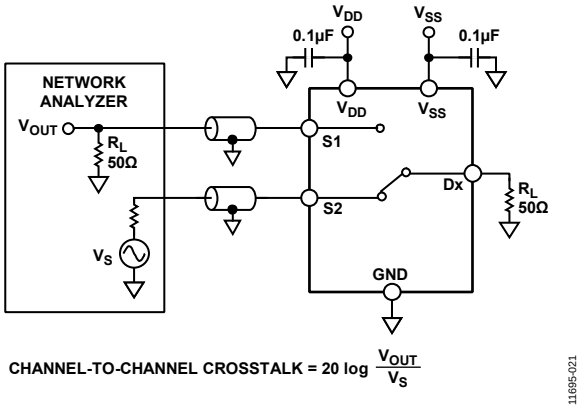

Figure 25. Channel-to-Channel Crosstalk

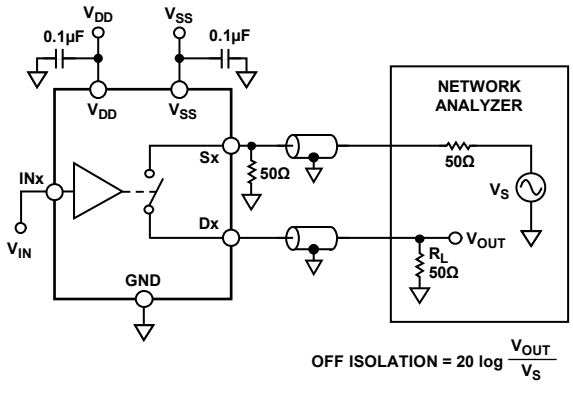

Figure 26. Off Isolation

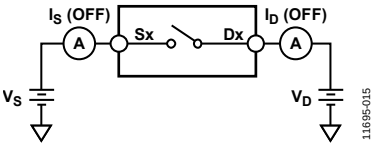

Figure 27. Off Leakage

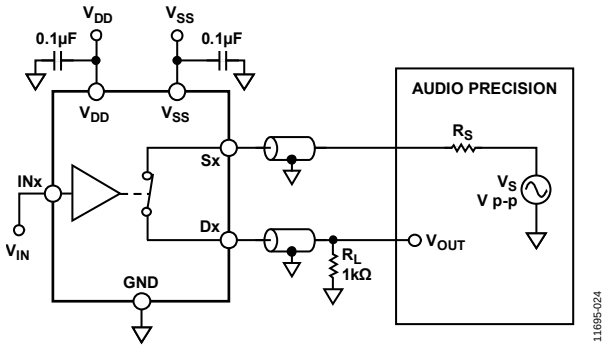

Figure 28. THD + Noise

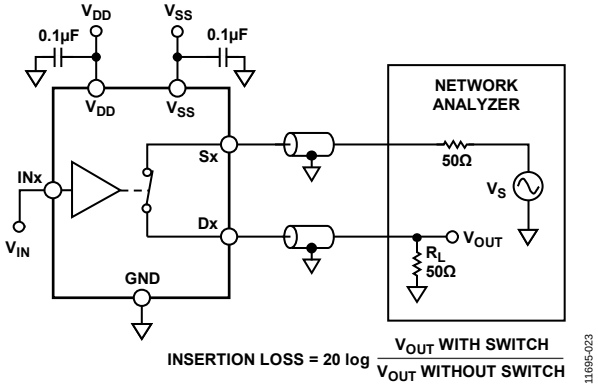

Figure 29. Bandwidth

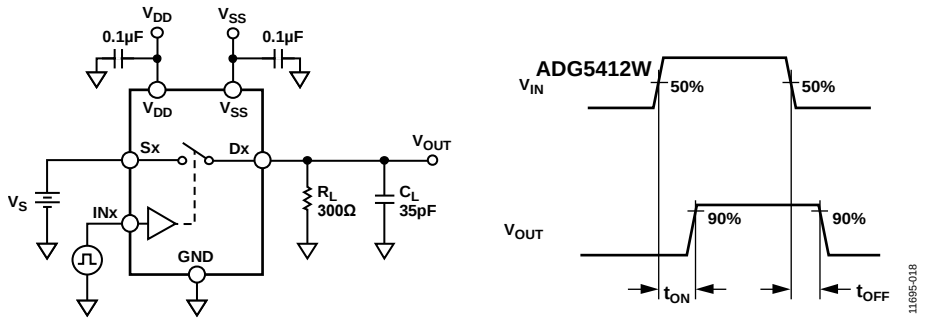

Figure 30. Switching Times

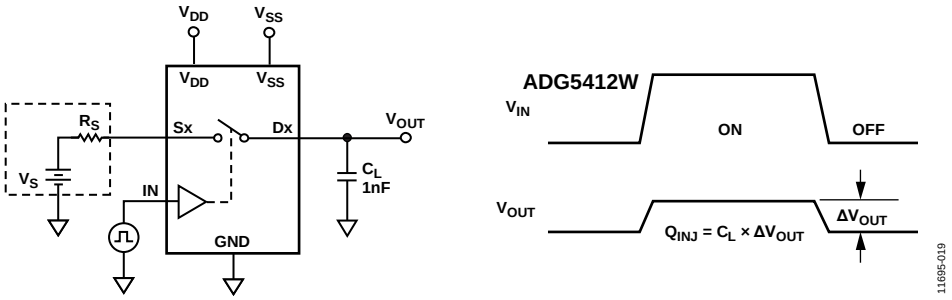

Figure 31. Charge Injection

TERMINOLOGY

I_{DD}
I_{DD} represents the positive supply current.

I_{SS}
I_{SS} represents the negative supply current.

V_D, V_S
V_D and V_S represent the analog voltage on Terminal D and Terminal S, respectively.

R_{ON}
R_{ON} represents the ohmic resistance between Terminal D and Terminal S.

ΔR_{ON}
ΔR_{ON} represents the difference between the R_{ON} of any two channels.

$R_{FLAT (ON)}$
Flatness that is defined as the difference between the maximum and minimum value of on resistance measured over the specified analog signal range is represented by $R_{FLAT (ON)}$.

I_S (Off)
I_S (Off) is the source leakage current with the switch off.

I_D (Off)
I_D (Off) is the drain leakage current with the switch off.

I_D (On), I_S (On)
I_D (On) and I_S (On) represent the channel leakage currents with the switch on.

V_{INL}
V_{INL} is the maximum input voltage for Logic 0.

V_{INH}
V_{INH} is the minimum input voltage for Logic 1.

I_{INL}, I_{INH}
I_{INL} and I_{INH} represent the low and high input currents of the digital inputs.

C_D (Off)
C_D (Off) represents the off switch drain capacitance, which is measured with reference to ground.

C_S (Off)
C_S (Off) represents the off switch source capacitance, which is measured with reference to ground.

C_D (On), C_S (On)
C_D (On) and C_S (On) represent on switch capacitances, which are measured with reference to ground.

C_{IN}
C_{IN} is the digital input capacitance.

t_{ON}
t_{ON} represents the delay between applying the digital control input and the output switching on.

t_{OFF}
t_{OFF} represents the delay between applying the digital control input and the output switching off.

t_D
t_D represents the off time measured between the 80% point of both switches when switching from one address state to another.

Off Isolation
Off isolation is a measure of unwanted signal coupling through an off switch.

Charge Injection
Charge injection is a measure of the glitch impulse transferred from the digital input to the analog output during switching.

Crosstalk
Crosstalk is a measure of unwanted signal that is coupled through from one channel to another as a result of parasitic capacitance.

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

On Response
On response is the frequency response of the on switch.

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

Total Harmonic Distortion + Noise (THD + N)
The ratio of the harmonic amplitude plus noise of the signal to the fundamental is represented by THD + N.

AC Power Supply Rejection Ratio (ACPSRR)
ACPSRR is the ratio of the amplitude of signal on the output to the amplitude of the modulation. This is a measure of the ability of the 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.

APPLICATIONS INFORMATION

The ADG54xx family of switches and multiplexers provide a robust solution for instrumentation, industrial, automotive, aerospace, and other harsh environments that are prone to latch-up, which is an undesirable high current state that can lead to device failure and persists until the power supply is turned off. The ADG5412W high voltage switches allow single-supply operation from 9 V to 40 V and dual-supply operation from ±9 V to ±22 V. The ADG5412W (as well as other select devices within the same family) achieve an 8 kV human body model ESD rating, which provides a robust solution eliminating the need for separate protect circuitry designs in some applications.

TRENCH ISOLATION

In the ADG5412W, an insulating oxide layer (trench) is placed between the NMOS and the PMOS transistors of each CMOS switch. Parasitic junctions, which occur between the transistors in junction isolated switches, are eliminated, and the result is a completely latch-up proof switch.

In junction isolation, the N and P wells of the PMOS and NMOS transistors form a diode that is reverse-biased under normal operation. However, during overvoltage conditions, this diode can become forward-biased. A silicon controlled rectifier (SCR) type circuit is formed by the two transistors causing a significant amplification of the current that, in turn, leads to latch-up. With trench isolation, this diode is removed, and the result is a latch-up proof switch.

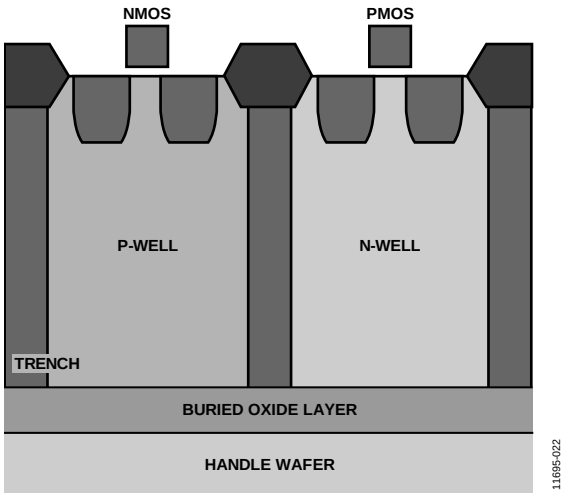

Figure 32. Trench Isolation

OUTLINE DIMENSIONS

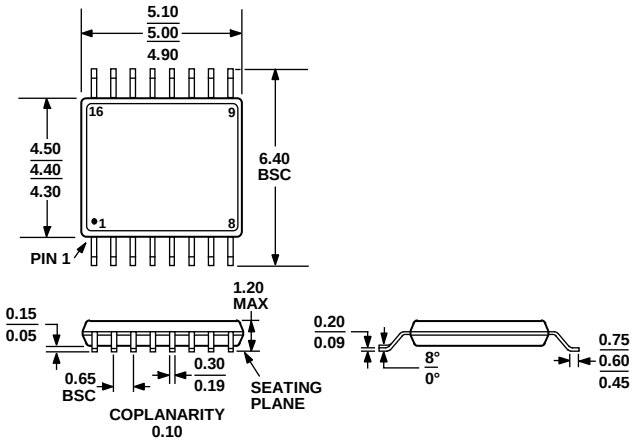

Figure 33. 16-Lead Thin Shrink Small Outline Package [TSSOP]
(RU-16)
Dimensions shown in millimeters

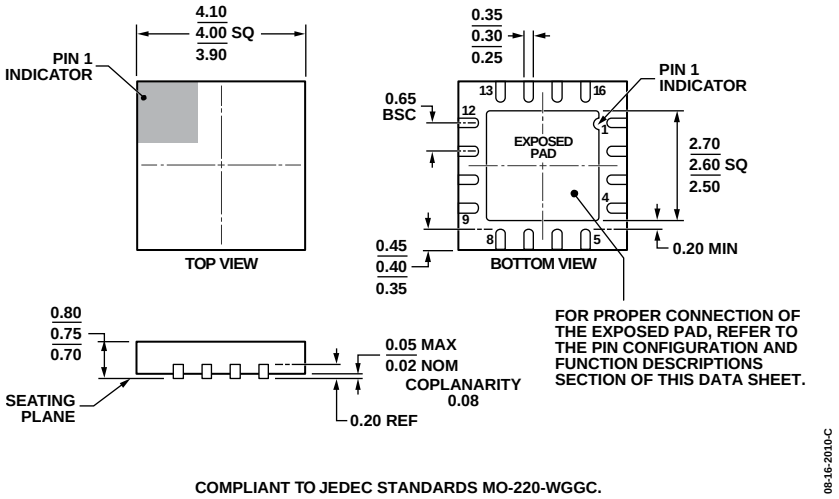

Figure 34. 16-Lead Lead Frame Chip Scale Package [LFCSP_WQ]
4 mm × 4 mm Body, Very Very Thin Quad
(CP-16-17)
Dimensions shown in millimeters

ORDERING GUIDE

Model[1, 2]	Temperature Range	Package Description	Package Option
ADG5412WBRUZ-REEL7	−40°C to +125°C	16-Lead Thin Shrink Small Outline Package [TSSOP]	RU-16
ADG5412WBCPZ-REEL7	−40°C to +125°C	16-Lead Lead Frame Chip Scale Package [LFCSP_WQ]	CP-16-17

[1] Z = RoHS Compliant Part.
[2] W = Qualified for Automotive Applications.

AUTOMOTIVE PRODUCTS

The ADG5412W models are available with controlled manufacturing to support the quality and reliability requirements of automotive applications. Note that these automotive models may have specifications that differ from the commercial models; therefore, designers should review the Specifications section of this data sheet carefully. Only the automotive grade products shown are available for use in automotive applications. Contact your local Analog Devices account representative for specific product ordering information and to obtain the specific Automotive Reliability reports for these models.

NOTES

NOTES

D11695-0-3/14(A)

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ADG5412WBCPZ-REEL7 ADG5412WBRUZ-REEL7