

## FEATURES

1  $\Omega$  on resistance  
0.2  $\Omega$  on resistance flatness  
Up to 430 mA continuous current  
Fully specified at  $\pm 12$  V,  $\pm 15$  V,  $\pm 5$  V  
No  $V_L$  supply required  
3 V logic-compatible inputs  
Rail-to-rail operation  
8-lead MSOP and 8-lead, 3 mm  $\times$  2 mm LFCSP packages

## APPLICATIONS

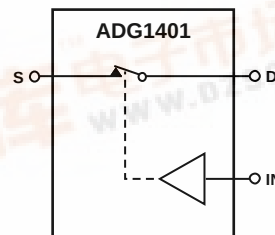
Automatic test equipment  
Data acquisition systems  
Battery-powered systems  
Sample-and-hold systems  
Audio signal routing  
Video signal routing  
Communication systems  
Relay replacements

## GENERAL DESCRIPTION

The ADG1401/ADG1402 contain a single-pole/single-throw (SPST) switch. Figure 1 shows that with a logic input of 1, the switch of the ADG1401 is closed and that of the ADG1402 is open. 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.

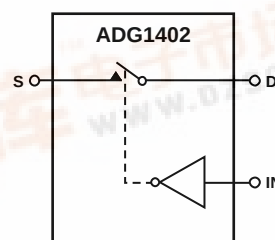
The iCMOS® (industrial CMOS) modular manufacturing process combines high voltage, complementary metal-oxide semiconductor (CMOS) and bipolar technologies. It enables the development of a wide range of high performance analog ICs capable of 33 V operation in a footprint that no other generation of high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

## FUNCTIONAL BLOCK DIAGRAM



SWITCHES SHOWN FOR A LOGIC 1 INPUT

Figure 1. ADG1401 Functional Block Diagram



SWITCHES SHOWN FOR A LOGIC 1 INPUT

Figure 2. ADG1402 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 iCMOS construction ensures ultralow power dissipation, making the part ideally suited for portable and battery-powered instruments.

## PRODUCT HIGHLIGHTS

1. 1.3  $\Omega$  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. 8-lead MSOP and 8-lead, 3 mm  $\times$  2 mm LFCSP packages.

Rev. 0

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REVISION HISTORY

10/09—Revision 0: Initial Version

# SPECIFICATIONS

## ±15 V DUAL SUPPLY

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

**Table 1.**

| Parameter                                  | 25°C  | −40°C to<br>+85°C | −40°C to<br>+125°C   | Unit              | Test Conditions/Comments                                                                             |
|--------------------------------------------|-------|-------------------|----------------------|-------------------|------------------------------------------------------------------------------------------------------|
| <b>ANALOG SWITCH</b>                       |       |                   |                      |                   |                                                                                                      |
| Analog Signal Range                        |       |                   | $V_{DD}$ to $V_{SS}$ | V                 |                                                                                                      |
| On Resistance, $R_{ON}$                    | 1     |                   |                      | $\Omega$ typ      | $V_S = \pm 10\text{ V}$ , $I_S = -10\text{ mA}$ ; see Figure 20                                      |
|                                            | 1.3   | 1.6               | 1.8                  | $\Omega$ max      | $V_{DD} = +13.5\text{ V}$ , $V_{SS} = -13.5\text{ V}$                                                |
| On Resistance Flatness, $R_{FLAT(ON)}$     | 0.2   |                   |                      | $\Omega$ typ      | $V_S = \pm 10\text{ V}$ ; $I_S = -10\text{ mA}$                                                      |
|                                            | 0.23  | 0.26              | 0.3                  | $\Omega$ max      |                                                                                                      |
| <b>LEAKAGE CURRENTS</b>                    |       |                   |                      |                   |                                                                                                      |
| Source Off Leakage, $I_S$ (Off)            | ±0.05 |                   |                      | nA typ            | $V_{DD} = +16.5\text{ V}$ , $V_{SS} = -16.5\text{ V}$                                                |
|                                            | ±0.4  | ±3                | ±150                 | nA max            | $V_S = \pm 10\text{ V}$ , $V_D = \pm 10\text{ V}$ ; see Figure 21                                    |
| Drain Off Leakage, $I_D$ (Off)             | ±0.05 |                   |                      | nA typ            | $V_S = \pm 10\text{ V}$ , $V_D = \pm 10\text{ V}$ ; see Figure 21                                    |
|                                            | ±0.4  | ±3                | ±150                 | nA max            |                                                                                                      |
| Channel On Leakage, $I_D$ , $I_S$ (On)     | ±0.2  |                   |                      | nA typ            | $V_S = V_D = \pm 10\text{ V}$ ; see Figure 22                                                        |
|                                            | ±1    | ±3                | ±150                 | 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 $I_{INH}$      | 0.002 |                   |                      | $\mu\text{A}$ typ | $V_{IN} = V_{GND}$ or $V_{DD}$                                                                       |
|                                            |       |                   | ±0.1                 | $\mu\text{A}$ max |                                                                                                      |
| Digital Input Capacitance, $C_{IN}$        | 4     |                   |                      | pF typ            |                                                                                                      |
| <b>DYNAMIC CHARACTERISTICS<sup>1</sup></b> |       |                   |                      |                   |                                                                                                      |
| $t_{ON}$                                   | 120   |                   |                      | ns typ            | $R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$                                                           |
|                                            | 150   | 185               | 215                  | ns max            | $V_S = 10\text{ V}$ ; see Figure 23                                                                  |
| $t_{OFF}$                                  | 120   |                   |                      | ns typ            | $R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$                                                           |
|                                            | 150   | 175               | 200                  | ns max            | $V_S = 10\text{ V}$ ; see Figure 23                                                                  |
| Charge Injection                           | −12   |                   |                      | pC typ            | $V_S = 0\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ; see Figure 24                         |
| Off Isolation                              | −58   |                   |                      | dB typ            | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 25                        |
| Total Harmonic Distortion + Noise          | 0.008 |                   |                      | % typ             | $R_L = 10\text{ k}\Omega$ , $5\text{ V rms}$ , $f = 20\text{ Hz}$ to $20\text{ kHz}$ ; see Figure 27 |
| −3 dB Bandwidth                            | 120   |                   |                      | MHz typ           | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; see Figure 26                                             |
| Insertion Loss                             | 0.08  |                   |                      | dB typ            | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 26                        |
| $C_S$ (Off)                                | 36    |                   |                      | pF typ            | $f = 1\text{ MHz}$ , $V_S = 0\text{ V}$                                                              |
| $C_D$ (Off)                                | 41    |                   |                      | pF typ            | $f = 1\text{ MHz}$ , $V_S = 0\text{ V}$                                                              |
| $C_D$ , $C_S$ (On)                         | 187   |                   |                      | pF typ            | $f = 1\text{ MHz}$ , $V_S = 0\text{ V}$                                                              |
| <b>POWER REQUIREMENTS</b>                  |       |                   |                      |                   |                                                                                                      |
| $I_{DD}$                                   | 0.002 |                   |                      | $\mu\text{A}$ typ | $V_{DD} = +16.5\text{ V}$ , $V_{SS} = -16.5\text{ V}$                                                |
|                                            |       |                   | 1.0                  | $\mu\text{A}$ max | Digital inputs = $0\text{ V}$ or $V_{DD}$                                                            |
| $I_{DD}$                                   | 60    |                   |                      | $\mu\text{A}$ typ | Digital inputs = $5\text{ V}$                                                                        |
|                                            |       |                   | 95                   | $\mu\text{A}$ max |                                                                                                      |
| $I_{SS}$                                   | 0.002 |                   |                      | $\mu\text{A}$ typ | Digital inputs = $0\text{ V}$ , $5\text{ V}$ , or $V_{DD}$                                           |
|                                            |       |                   | 1.0                  | $\mu\text{A}$ max |                                                                                                      |
| $V_{DD}/V_{SS}$                            |       |                   | ±4.5/±16.5           | V min/max         | Ground = $0\text{ V}$                                                                                |

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

# ADG1401/ADG1402

查询"ADG1401"供应商

## +12 V SINGLE SUPPLY

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

Table 2.

| Parameter                                                | 25°C  | −40°C to<br>+85°C | −40°C to<br>+125°C     | Unit      | Test Conditions/Comments                                                                                                                                                         |
|----------------------------------------------------------|-------|-------------------|------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANALOG SWITCH                                            |       |                   |                        |           |                                                                                                                                                                                  |
| Analog Signal Range                                      |       |                   | 0 V to V <sub>DD</sub> | V         | V <sub>S</sub> = 0 V to 10 V, I <sub>S</sub> = −10 mA; see Figure 20<br>V <sub>DD</sub> = 10.8 V, V <sub>SS</sub> = 0 V<br>V <sub>S</sub> = 0 V to 10 V, I <sub>S</sub> = −10 mA |
| On Resistance, R <sub>ON</sub>                           | 2     |                   |                        | Ω typ     |                                                                                                                                                                                  |
|                                                          | 2.4   | 2.9               | 3.2                    | Ω max     |                                                                                                                                                                                  |
| On Resistance Flatness, R <sub>FLAT (ON)</sub>           | 0.6   |                   |                        | Ω typ     |                                                                                                                                                                                  |
|                                                          | 0.68  | 0.8               | 0.85                   | Ω max     |                                                                                                                                                                                  |
| LEAKAGE CURRENTS                                         |       |                   |                        |           |                                                                                                                                                                                  |
| Source Off Leakage, I <sub>S</sub> (Off)                 | ±0.05 |                   |                        | nA typ    | V <sub>DD</sub> = 13.2 V, V <sub>SS</sub> = 0 V<br>V <sub>S</sub> = 1 V/10 V, V <sub>D</sub> = 10 V/1 V; see Figure 21                                                           |
|                                                          | ±0.4  | ±3                | ±150                   | nA max    |                                                                                                                                                                                  |
| Drain Off Leakage, I <sub>D</sub> (Off)                  | ±0.05 |                   |                        | nA typ    | V <sub>S</sub> = 1 V/10 V, V <sub>D</sub> = 10 V/1 V; see Figure 21                                                                                                              |
|                                                          | ±0.4  | ±3                | ±150                   | nA max    |                                                                                                                                                                                  |
| Channel On Leakage, I <sub>D</sub> , I <sub>S</sub> (On) | ±0.2  |                   |                        | nA typ    | V <sub>S</sub> = V <sub>D</sub> = 1 V or 10 V; see Figure 22                                                                                                                     |
|                                                          | ±1    | ±3                | ±150                   | nA max    |                                                                                                                                                                                  |
| DIGITAL INPUTS                                           |       |                   |                        |           |                                                                                                                                                                                  |
| Input High Voltage, V <sub>INH</sub>                     |       |                   | 2.0                    | V min     | V <sub>IN</sub> = V <sub>GND</sub> or V <sub>DD</sub>                                                                                                                            |
| Input Low Voltage, V <sub>INL</sub>                      |       |                   | 0.8                    | V max     |                                                                                                                                                                                  |
| Input Current, I <sub>INL</sub> or I <sub>INH</sub>      | 0.002 |                   |                        | μA typ    |                                                                                                                                                                                  |
|                                                          |       |                   | ±0.1                   | μA max    |                                                                                                                                                                                  |
| Digital Input Capacitance, C <sub>IN</sub>               | 4     |                   |                        | pF typ    |                                                                                                                                                                                  |
| DYNAMIC CHARACTERISTICS <sup>1</sup>                     |       |                   |                        |           |                                                                                                                                                                                  |
| t <sub>ON</sub>                                          | 180   |                   |                        | ns typ    | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>V <sub>S</sub> = 8 V; see Figure 23                                                                                            |
|                                                          | 235   | 295               | 335                    | ns max    |                                                                                                                                                                                  |
| t <sub>OFF</sub>                                         | 140   |                   |                        | ns typ    | R <sub>L</sub> = 300 Ω, C <sub>L</sub> = 35 pF<br>V <sub>S</sub> = 8 V; see Figure 23                                                                                            |
|                                                          | 185   | 215               | 260                    | ns max    |                                                                                                                                                                                  |
| Charge Injection                                         | 57    |                   |                        | pC typ    | V <sub>S</sub> = 6 V, R <sub>S</sub> = 0 Ω, C <sub>L</sub> = 1 nF; see Figure 24                                                                                                 |
| Off Isolation                                            | −58   |                   |                        | dB typ    | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz; see Figure 25                                                                                                           |
| −3 dB Bandwidth                                          | 82    |                   |                        | MHz typ   | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF; see Figure 26                                                                                                                      |
| Insertion Loss                                           | 0.15  |                   |                        | dB typ    | R <sub>L</sub> = 50 Ω, C <sub>L</sub> = 5 pF, f = 1 MHz; see Figure 26                                                                                                           |
| C <sub>S</sub> (Off)                                     | 61    |                   |                        | pF typ    | f = 1 MHz, V <sub>S</sub> = 6 V                                                                                                                                                  |
| C <sub>D</sub> (Off)                                     | 68    |                   |                        | pF typ    | f = 1 MHz, V <sub>S</sub> = 6 V                                                                                                                                                  |
| C <sub>D</sub> , C <sub>S</sub> (On)                     | 181   |                   |                        | pF typ    | f = 1 MHz, V <sub>S</sub> = 6 V                                                                                                                                                  |
| POWER REQUIREMENTS                                       |       |                   |                        |           |                                                                                                                                                                                  |
| I <sub>DD</sub>                                          | 0.001 |                   |                        | μA typ    | V <sub>DD</sub> = 13.2 V<br>Digital inputs = 0 V or V <sub>DD</sub>                                                                                                              |
|                                                          |       |                   | 1.0                    | μA max    |                                                                                                                                                                                  |
| I <sub>DD</sub>                                          | 60    |                   |                        | μA typ    | Digital inputs = 5 V                                                                                                                                                             |
|                                                          |       |                   | 95                     | μA max    |                                                                                                                                                                                  |
| V <sub>DD</sub>                                          |       |                   | 5/16.5                 | V min/max | Ground = 0 V, V <sub>SS</sub> = 0 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<br>+85°C | –40°C to<br>+125°C | Unit              | Test Conditions/Comments                                                                   |
|--------------------------------------------|------------|-------------------|--------------------|-------------------|--------------------------------------------------------------------------------------------|
| <b>ANALOG SWITCH</b>                       |            |                   |                    |                   |                                                                                            |
| Analog Signal Range                        |            |                   | 0 V to $V_{DD}$    | V                 |                                                                                            |
| On Resistance, $R_{ON}$                    | 2.3        |                   |                    | $\Omega$ typ      | $V_S = \pm 4.5\text{ V}$ , $I_S = -10\text{ mA}$ ; see Figure 20                           |
|                                            | 2.7        | 3.3               | 3.7                | $\Omega$ max      | $V_{DD} = +4.5\text{ V}$ , $V_{SS} = -4.5\text{ V}$                                        |
| On Resistance Flatness, $R_{FLAT(ON)}$     | 0.65       |                   |                    | $\Omega$ typ      | $V_S = \pm 4.5\text{ V}$ , $I_S = -10\text{ mA}$                                           |
|                                            | 0.72       | 0.85              | 0.9                | $\Omega$ max      |                                                                                            |
| <b>LEAKAGE CURRENTS</b>                    |            |                   |                    |                   |                                                                                            |
| Source Off Leakage, $I_S$ (Off)            | $\pm 0.02$ |                   |                    | nA typ            | $V_{DD} = +5.5\text{ V}$ , $V_{SS} = -5.5\text{ V}$                                        |
|                                            | $\pm 0.4$  | $\pm 3$           | $\pm 150$          | nA max            | $V_S = \pm 4.5\text{ V}$ , $V_D = \mp 4.5\text{ V}$ ; see Figure 21                        |
| Drain Off Leakage, $I_D$ (Off)             | $\pm 0.02$ |                   |                    | nA typ            |                                                                                            |
|                                            | $\pm 0.4$  | $\pm 3$           | $\pm 150$          | nA max            | $V_S = \pm 4.5\text{ V}$ , $V_D = \mp 4.5\text{ V}$ ; see Figure 21                        |
| Channel On Leakage, $I_D$ , $I_S$ (On)     | $\pm 0.1$  |                   |                    | nA typ            | $V_S = V_D = \pm 4.5\text{ V}$ ; see Figure 22                                             |
|                                            | $\pm 1$    | $\pm 3$           | $\pm 150$          | 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 $I_{INH}$      | 0.002      |                   |                    | $\mu\text{A}$ 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> |            |                   |                    |                   |                                                                                            |
| $t_{ON}$                                   | 290        |                   |                    | ns typ            | $R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$                                                 |
|                                            | 375        | 460               | 520                | ns max            | $V_S = 3\text{ V}$ ; see Figure 23                                                         |
| $t_{OFF}$                                  | 235        |                   |                    | ns typ            | $R_L = 300\ \Omega$ , $C_L = 35\text{ pF}$                                                 |
|                                            | 305        | 365               | 405                | ns max            | $V_S = 3\text{ V}$ ; see Figure 23                                                         |
| Charge Injection                           | 145        |                   |                    | pC typ            | $V_S = 0\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ; see Figure 24               |
| Off Isolation                              | –58        |                   |                    | dB typ            | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 25              |
| Total Harmonic Distortion + Noise          | 0.02       |                   |                    | % typ             | $R_L = 10\text{ k}\Omega$ , 5 V p-p, $f = 20\text{ Hz}$ to $20\text{ kHz}$ ; see Figure 27 |
| –3 dB Bandwidth                            | 79         |                   |                    | MHz typ           | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; see Figure 26                                   |
| Insertion Loss                             | 0.14       |                   |                    | dB typ            | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 1\text{ MHz}$ ; see Figure 26              |
| $C_S$ (Off)                                | 52         |                   |                    | pF typ            | $V_S = 0\text{ V}$ , $f = 1\text{ MHz}$                                                    |
| $C_D$ (Off)                                | 58         |                   |                    | pF typ            | $V_S = 0\text{ V}$ , $f = 1\text{ MHz}$                                                    |
| $C_D$ , $C_S$ (On)                         | 198        |                   |                    | pF typ            | $V_S = 0\text{ V}$ , $f = 1\text{ MHz}$                                                    |
| <b>POWER REQUIREMENTS</b>                  |            |                   |                    |                   |                                                                                            |
| $I_{DD}$                                   | 0.001      |                   |                    | $\mu\text{A}$ typ | $V_{DD} = +5.5\text{ V}$ , $V_{SS} = -5.5\text{ V}$                                        |
|                                            |            |                   | 1.0                | $\mu\text{A}$ max | Digital inputs = 0 V or $V_{DD}$                                                           |
| $I_{SS}$                                   | 0.001      |                   |                    | $\mu\text{A}$ typ | Digital inputs = 0 V or $V_{DD}$                                                           |
|                                            |            |                   | 1.0                | $\mu\text{A}$ max |                                                                                            |
| $V_{DD}/V_{SS}$                            |            |                   | $\pm 4.5/\pm 16.5$ | V min/max         | Ground = 0 V                                                                               |

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

## CONTINUOUS CURRENT PER CHANNEL, S OR D

Table 4.

| Parameter                                             | 25°C | 85°C | 125°C | Unit       | Test Conditions/Comments                           |
|-------------------------------------------------------|------|------|-------|------------|----------------------------------------------------|
| CONTINUOUS CURRENT, S or D <sup>1</sup>               |      |      |       |            |                                                    |
| ±15 V Dual Supply                                     |      |      |       |            | $V_{DD} = +13.5\text{ V}, V_{SS} = -13.5\text{ V}$ |
| 8-Lead MSOP ( $\theta_{JA} = 206^\circ\text{C/W}$ )   | 275  | 190  | 125   | mA maximum |                                                    |
| 8-Lead LFCSP ( $\theta_{JA} = 50.8^\circ\text{C/W}$ ) | 430  | 275  | 160   | mA maximum |                                                    |
| +12 V Single Supply                                   |      |      |       |            | $V_{DD} = 10.8\text{ V}, V_{SS} = 0\text{ V}$      |
| 8-Lead MSOP ( $\theta_{JA} = 206^\circ\text{C/W}$ )   | 255  | 180  | 120   | mA maximum |                                                    |
| 8-Lead LFCSP ( $\theta_{JA} = 50.8^\circ\text{C/W}$ ) | 355  | 235  | 145   | mA maximum |                                                    |
| ±5 V Dual Supply                                      |      |      |       |            | $V_{DD} = +4.5\text{ V}, V_{SS} = -4.5\text{ V}$   |
| 8-Lead MSOP ( $\theta_{JA} = 206^\circ\text{C/W}$ )   | 250  | 175  | 120   | mA maximum |                                                    |
| 8-Lead LFCSP ( $\theta_{JA} = 50.8^\circ\text{C/W}$ ) | 340  | 225  | 140   | 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<br>(Pulsed at 1 ms, 10%<br>Duty-Cycle Maximum) |                                                                                     |
| 8-Lead MSOP (4-Layer Board)                                         | 500 mA                                                                              |
| 8-Lead LFCSP                                                        | 700 mA                                                                              |
| Continuous Current per<br>Channel, S or D                           | Data in Table 4 + 15%                                                               |
| Operating Temperature Range<br>Industrial                           | −40°C to +125°C                                                                     |
| Storage Temperature Range                                           | −65°C to +150°C                                                                     |
| Junction Temperature                                                | 150°C                                                                               |
| Reflow Soldering Peak<br>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 |
|-----------------------------|---------------|---------------|------|
| 8-Lead MSOP (4-Layer Board) | 206           | 44            | °C/W |
| 8-Lead LFCSP                | 50.8          |               | °C/W |

## ESD CAUTION

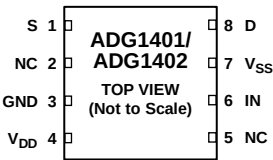


**ESD (electrostatic discharge) sensitive device.** Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken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

ADG1401/ADG1402

[查询"ADG1401"供应商](#)

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS



- NOTES  
1. EXPOSED PAD TIED TO SUBSTRATE, VSS.  
2. NC = NO CONNECT.

08486-003

Figure 3. ADG1401/ADG1402 Pin Configuration

Table 7. ADG1401/ADG1402 Pin Function Descriptions

| Pin No. | Mnemonic | Description                                            |
|---------|----------|--------------------------------------------------------|
| 1       | S        | Source Terminal. This pin can be an input or output.   |
| 2       | NC       | No Connect.                                            |
| 3       | GND      | Ground (0 V) Reference.                                |
| 4       | VDD      | Most Positive Power Supply Potential.                  |
| 5       | NC       | No Connect.                                            |
| 6       | IN       | Logic Control Input.                                   |
| 7       | VSS      | Most Negative Power Supply Potential.                  |
| 8       | D        | Drain Terminal. This pin can be an input or output.    |
|         | EPAD     | Exposed pad tied to substrate, VSS, for LFCSP package. |

Table 8. ADG1401/ADG1402 Truth Table

| ADG1401 IN | ADG1402 IN | Switch Condition |
|------------|------------|------------------|
| 1          | 0          | On               |
| 0          | 1          | Off              |



## TYPICAL PERFORMANCE CHARACTERISTICS

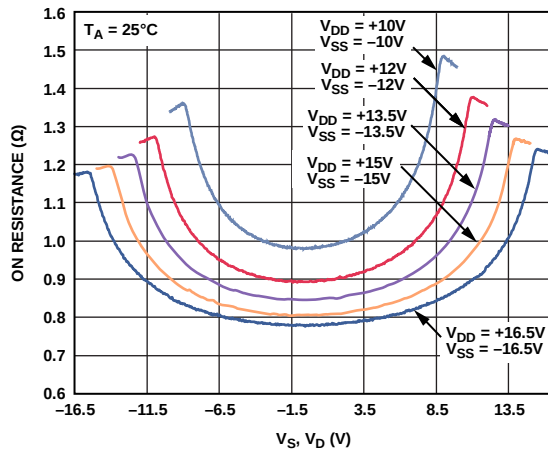


Figure 4. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Dual Supply

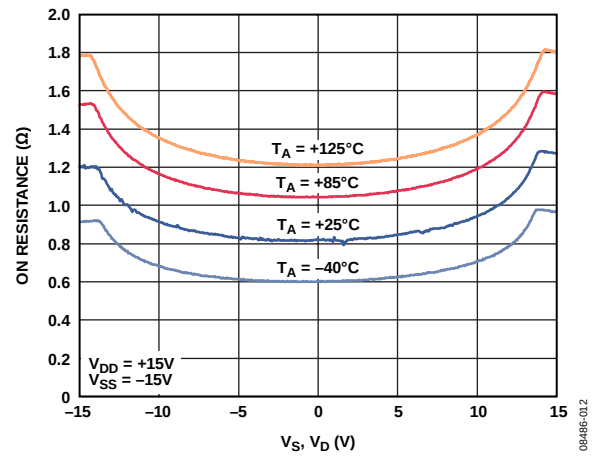


Figure 7. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Different Temperatures,  $\pm 15$  V Dual Supply

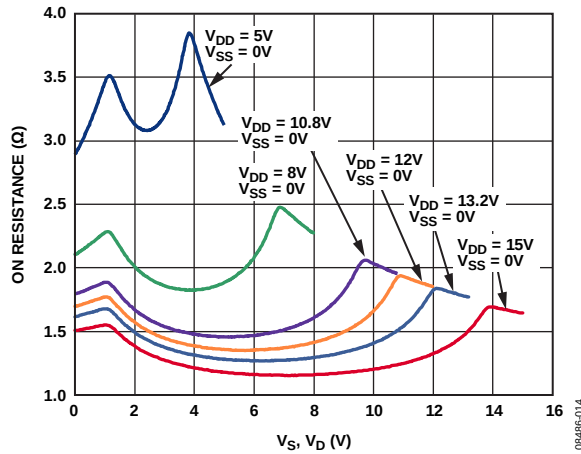


Figure 5. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Single Supply

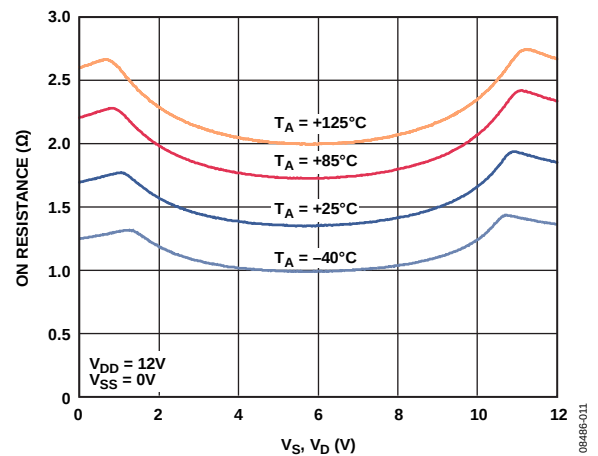


Figure 8. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Different Temperatures, +12 V Single Supply

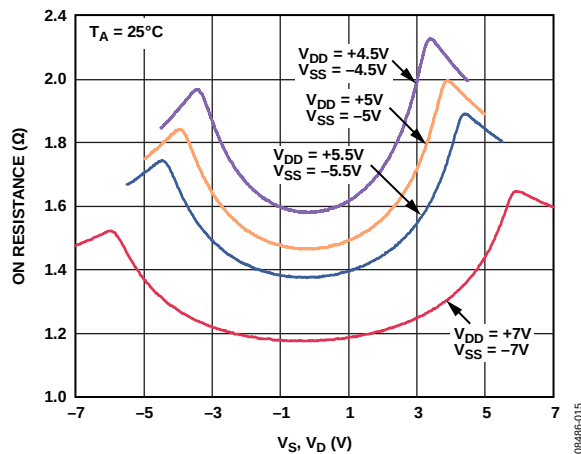


Figure 6. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Dual Supply

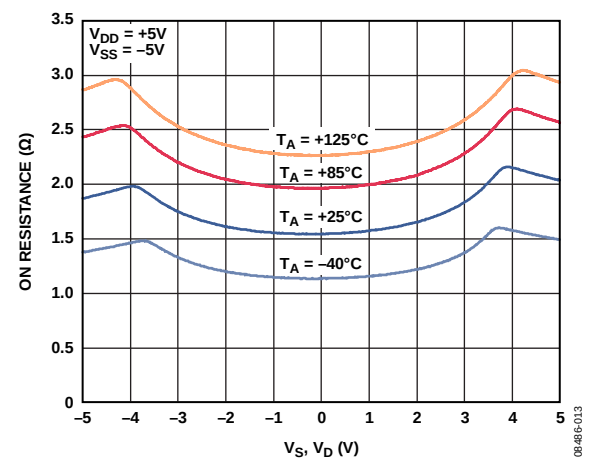


Figure 9. On Resistance as a Function of  $V_D$  ( $V_S$ ) for Different Temperatures,  $\pm 5$  V Dual Supply

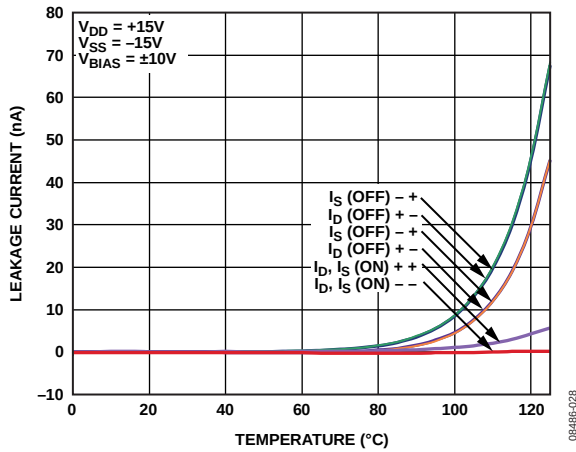


Figure 10. Leakage Currents as a Function of Temperature, ±15 V Dual Supply

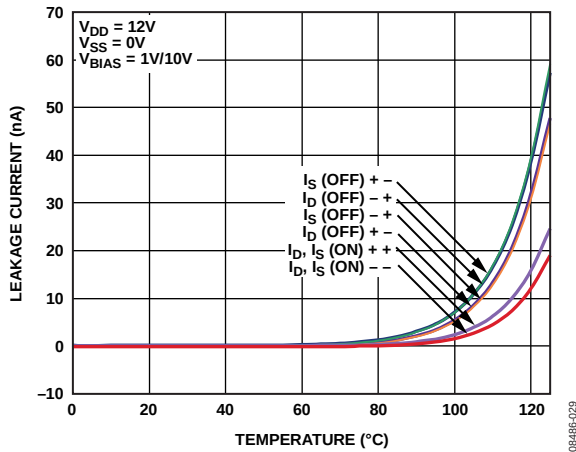


Figure 11. Leakage Currents as a Function of Temperature, +12 V Single Supply

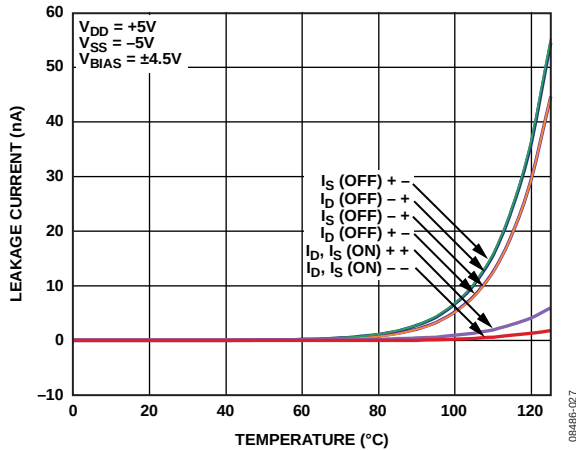


Figure 12. Leakage Currents as a Function of Temperature, ±5 V Dual Supply

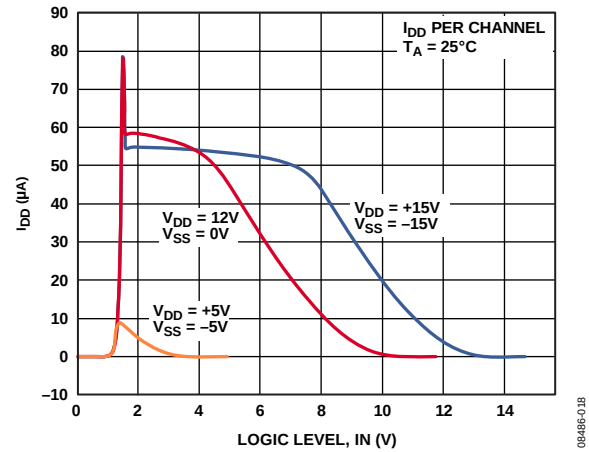


Figure 13.  $I_{DD}$  vs. Logic Level

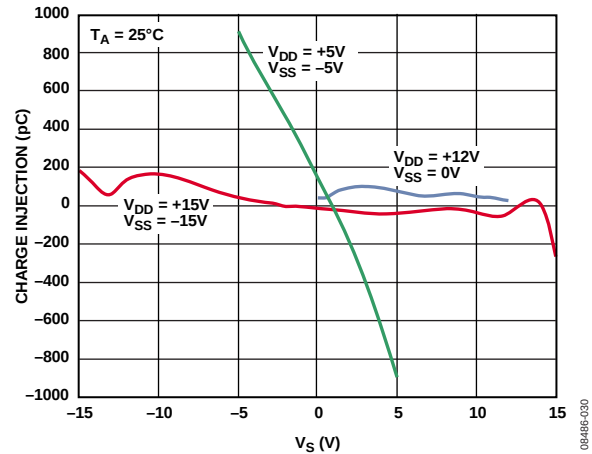


Figure 14. Charge Injection vs. Source Voltage

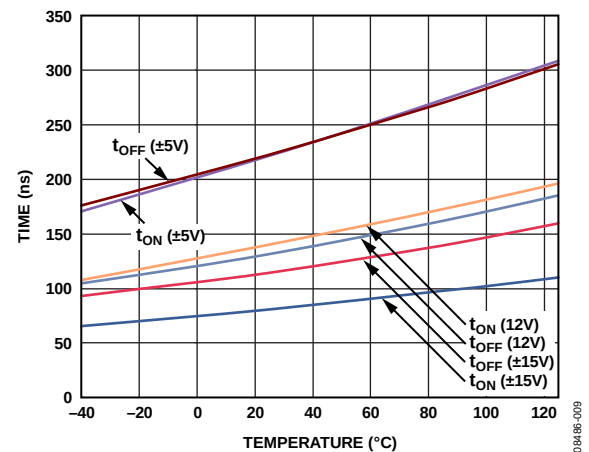


Figure 15.  $t_{ON}/t_{OFF}$  Times vs. Temperature

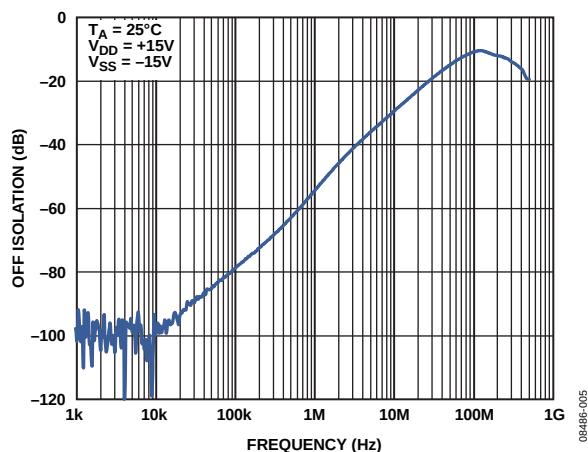


Figure 16. Off Isolation vs. Frequency

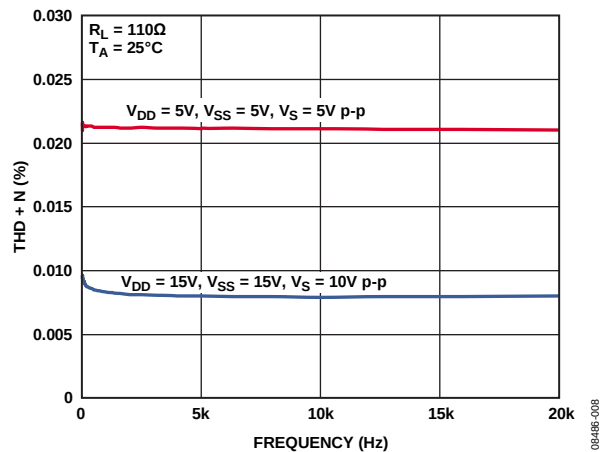


Figure 18. THD + N vs. Frequency

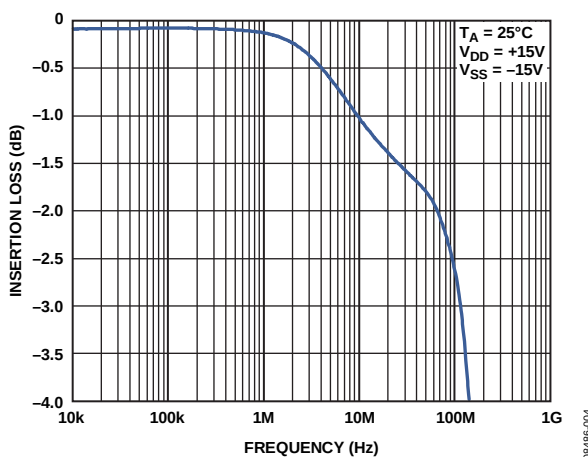


Figure 17. On Response vs. Frequency

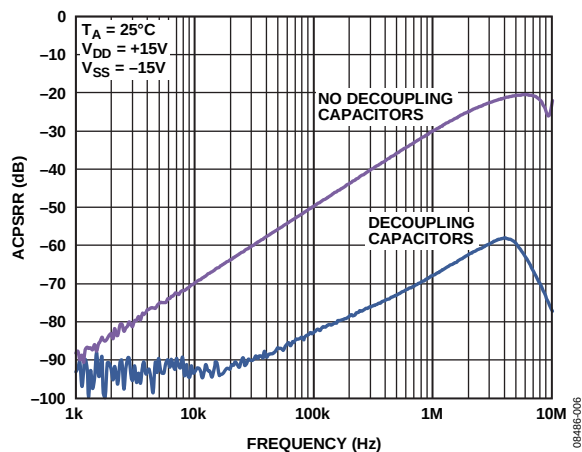


Figure 19. ACPSRR vs. Frequency

## TEST CIRCUITS

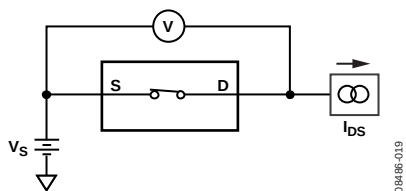


Figure 20. On Resistance

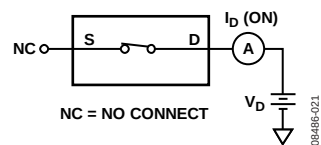


Figure 22. On Leakage

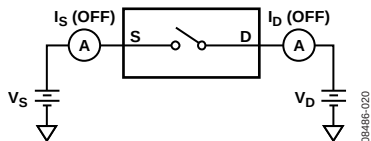


Figure 21. Off Leakage

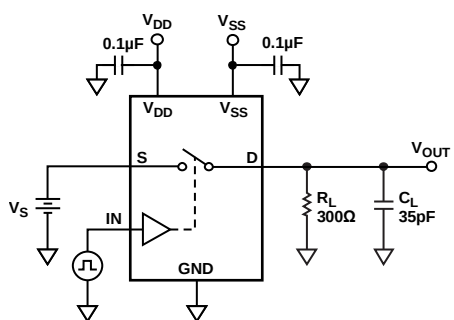


Figure 23. Switching Times,  $t_{ON}$  and  $t_{OFF}$

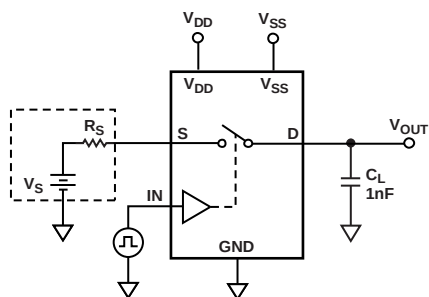
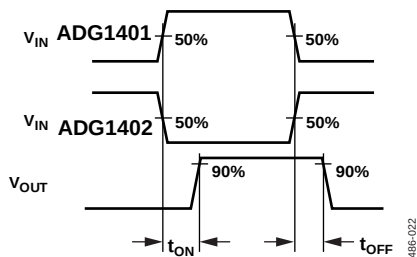
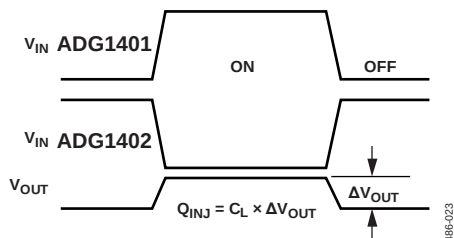
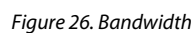
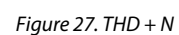
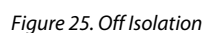


Figure 24. Charge Injection





## 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</sub> (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<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>**

Delay time between the 50% and 90% points of the digital input and switch on condition. See Figure 23.

### **t<sub>OFF</sub>**

Delay time between the 50% and 90% points of the digital input and switch off condition. See Figure 23.

### **Charge Injection**

A measure of the glitch impulse transferred from the digital input to the analog output during switching. See Figure 24.

### **Off Isolation**

A measure of unwanted signal coupling through an off switch. See Figure 25.

### **Bandwidth**

The frequency at which the output is attenuated by 3 dB. See Figure 26.

### **On Response**

The frequency response of the on switch.

### **Insertion Loss**

The loss due to the on resistance of the switch. See Figure 26.

### **THD + N**

The ratio of the harmonic amplitude plus noise of the signal to the fundamental. See Figure 27.

### **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 the signal on the output to the amplitude of the modulation is the ACPSRR. See Figure 19.

# OUTLINE DIMENSIONS

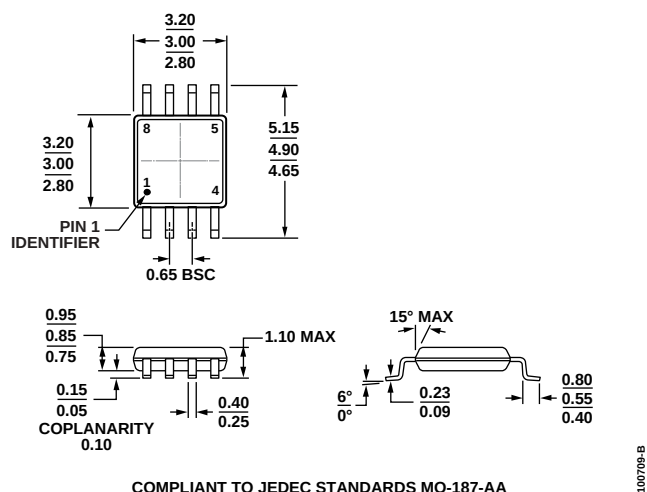


Figure 28. 8-Lead Mini Small Outline Package [MSOP]  
(RM-8)

Dimensions shown in millimeters

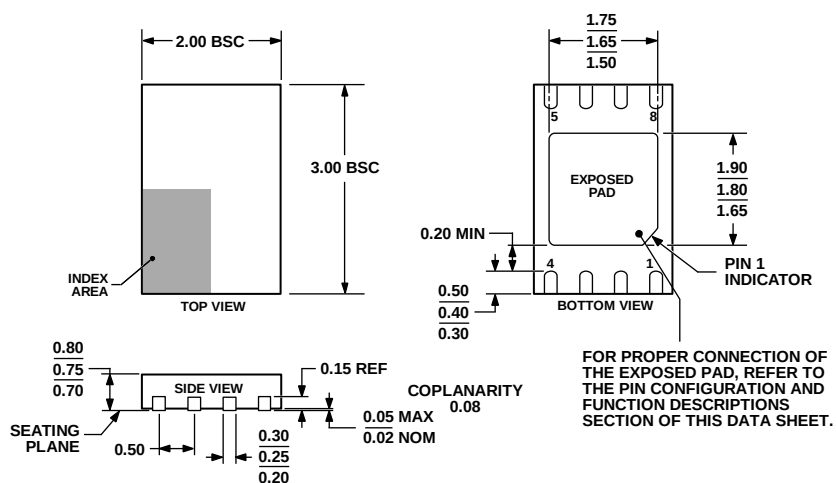


Figure 29. 8-Lead Lead Frame Chip Scale Package [LFCSP\_WD]  
3 mm × 2 mm Body, Very Very Thin, Dual Lead  
(CP-8-4)

Dimensions shown in millimeters

## ORDERING GUIDE

| Model                          | Temperature Range | Package Description                             | Package Option | Branding |
|--------------------------------|-------------------|-------------------------------------------------|----------------|----------|
| ADG1401BRMZ <sup>1</sup>       | −40°C to +125°C   | 8-Lead Mini Small Outline Package [MSOP]        | RM-8           | S2T      |
| ADG1401BRMZ-REEL7 <sup>1</sup> | −40°C to +125°C   | 8-Lead Mini Small Outline Package [MSOP]        | RM-8           | S2T      |
| ADG1401BCPZ-REEL7 <sup>1</sup> | −40°C to +125°C   | 8-Lead Lead Frame Chip Scale Package [LFCSP_WD] | CP-8-4         | 2Y       |
| ADG1402BRMZ <sup>1</sup>       | −40°C to +125°C   | 8-Lead Mini Small Outline Package [MSOP]        | RM-8           | S2U      |
| ADG1402BRMZ-REEL7 <sup>1</sup> | −40°C to +125°C   | 8-Lead Mini Small Outline Package [MSOP]        | RM-8           | S2U      |
| ADG1402BCPZ-REEL7 <sup>1</sup> | −40°C to +125°C   | 8-Lead Lead Frame Chip Scale Package [LFCSP_WD] | CP-8-4         | 1F       |

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

**ADG1401/ADG1402**

[查询"ADG1401"供应商](#)

## NOTES