

## FEATURES

- 1.8 V to 5.5 V operation
- Ultralow on resistance
  - 0.28  $\Omega$  typical at 5 V supply
  - 0.41  $\Omega$  maximum at 5 V supply
- Excellent audio performance, ultralow distortion
  - 0.1  $\Omega$  typical
  - 0.15  $\Omega$  maximum  $R_{ON}$  flatness
- High current carrying capability
  - 400 mA continuous
  - 600 mA peak current at 5 V supply
- Rail-to-rail switching operation
- Typical power consumption ( $<0.1 \mu W$ )

## APPLICATIONS

- Cellular phones
- PDA's
- MP3 players
- Power routing
- Battery-powered systems
- PCMCIA cards
- Modems
- Audio and video signal routing
- Communications systems

## GENERAL DESCRIPTION

The **ADG884** is a low voltage CMOS device containing two independently selectable single-pole, double-throw (SPDT) switches. This device offers ultralow on resistance of 0.41  $\Omega$  over the full temperature range, making the part an ideal solution for applications that require minimal distortion through the switch. The **ADG884** also has the capability of carrying large amounts of current, typically 600 mA at 5 V operation.

The **ADG884** is available in a 10-ball, 2 mm  $\times$  1.5 mm WLCSP package, a 10-lead LFCSP\_WD package, and a 10-lead MSOP package. These tiny packages make the **ADG884** the ideal solution for space-constrained applications.

When on, each switch conducts equally well in both directions and has an input signal range that extends to the supplies. The **ADG884** exhibits break-before-make switching action.

## FUNCTIONAL BLOCK DIAGRAM

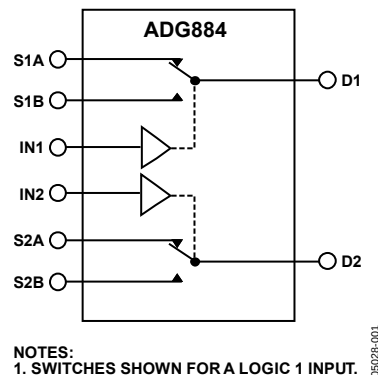


Figure 1.

## PRODUCT HIGHLIGHTS

1. Single 1.8 V to 5.5 V operation.
2. High current handling capability (400 mA continuous current).
3. 1.8 V logic compatible.
4. Low THD + N (0.01% typical).
5. Tiny 2 mm  $\times$  1.5 mm WLCSP, 3 mm  $\times$  3 mm 10-lead LFCSP\_WD, and 10-lead MSOP packages.

### Rev. D

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## REVISION HISTORY

### 4/12—Rev. C to Rev. D

|                                                         |   |
|---------------------------------------------------------|---|
| Added Exposed Pad Notation to Figure 2 and Table 5..... | 7 |
| Changes to Figure 3 and Table 6.....                    | 7 |

### 6/08—Rev. B to Rev. C

|                                    |           |
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| Changes to Temperature Range.....  | Universal |
| Changes to Product Highlights..... | 1         |
| Changes to Table 4.....            | 6         |
| Updated Outline Dimensions .....   | 14        |
| Changes to the Ordering Guide..... | 15        |

### 7/06—Rev. A to Rev. B

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| Changes to Features Section.....   | 1  |
| Changes to Table 1.....            | 3  |
| Changes to Table 2.....            | 4  |
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| Changes to the Ordering Guide..... | 15 |

### 6/05—Rev. 0 to Rev. A

|                                  |    |
|----------------------------------|----|
| Updated Outline Dimensions ..... | 14 |
| Changes to Ordering Guide .....  | 15 |

### 10/04—Revision 0: Initial Version

## SPECIFICATIONS

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

Table 1.

| Parameter                                             | 25°C      | −40°C to +85°C | Unit              | Test Conditions/Comments                                                                                         |
|-------------------------------------------------------|-----------|----------------|-------------------|------------------------------------------------------------------------------------------------------------------|
| <b>ANALOG SWITCH</b>                                  |           |                |                   |                                                                                                                  |
| Analog Signal Range                                   |           | 0 to $V_{DD}$  | V                 |                                                                                                                  |
| On Resistance, $R_{ON}$                               | 0.28      |                | $\Omega$ typ      | $V_{DD} = 4.5\text{ V}$ , $V_S = 0\text{ V}$ to $V_{DD}$ , $I_S = 100\text{ mA}$                                 |
|                                                       | 0.37      | 0.41           | $\Omega$ max      | See Figure 18                                                                                                    |
| On-Resistance Match Between Channels, $\Delta R_{ON}$ | 0.01      |                | $\Omega$ typ      | $V_{DD} = 4.5\text{ V}$ , $V_S = 2\text{ V}$ , $I_S = 100\text{ mA}$                                             |
|                                                       | 0.035     | 0.05           | $\Omega$ max      |                                                                                                                  |
| On-Resistance Flatness, $R_{FLAT}$ (On)               | 0.1       |                | $\Omega$ typ      | $V_{DD} = 4.5\text{ V}$ , $V_S = 0\text{ V}$ to $V_{DD}$                                                         |
|                                                       | 0.13      | 0.15           | $\Omega$ max      | $I_S = 100\text{ mA}$                                                                                            |
| <b>LEAKAGE CURRENTS</b>                               |           |                |                   |                                                                                                                  |
| Source Off Leakage, $I_S$ (Off)                       | $\pm 0.2$ |                | nA typ            | $V_{DD} = 5.5\text{ V}$<br>$V_S = 0.6\text{ V}/4.5\text{ V}$ , $V_D = 4.5\text{ V}/0.6\text{ V}$ ; see Figure 19 |
| Channel On Leakage, $I_D$ , $I_S$ (On)                | $\pm 0.2$ |                | nA typ            | $V_S = V_D = 0.6\text{ V}$ or $4.5\text{ V}$ ; see Figure 20                                                     |
| <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 | $V_{IN} = V_{INL}$ or $V_{INH}$                                                                                  |
|                                                       |           | $\pm 0.1$      | $\mu\text{A}$ max |                                                                                                                  |
| Digital Input Capacitance, $C_{IN}$                   | 2         |                | pF typ            |                                                                                                                  |
| <b>DYNAMIC CHARACTERISTICS<sup>1</sup></b>            |           |                |                   |                                                                                                                  |
| $t_{ON}$                                              | 42        |                | ns typ            | $R_L = 50\ \Omega$ , $C_L = 35\text{ pF}$                                                                        |
|                                                       | 50        | 53             | ns max            | $V_S = 3\text{ V}/0\text{ V}$ ; see Figure 21                                                                    |
| $t_{OFF}$                                             | 15        |                | ns typ            | $R_L = 50\ \Omega$ , $C_L = 35\text{ pF}$                                                                        |
|                                                       | 20        | 21             | ns max            | $V_S = 3\text{ V}$ ; see Figure 21                                                                               |
| Break-Before-Make Time Delay, $t_{BBM}$               | 16        |                | ns typ            | $R_L = 50\ \Omega$ , $C_L = 35\text{ pF}$                                                                        |
|                                                       |           | 10             | ns min            | $V_{S1} = V_{S2} = 1.5\text{ V}$ ; see Figure 22                                                                 |
| Charge Injection                                      | 125       |                | pC typ            | $V_S = 1.5\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ; see Figure 23                                   |
| Off Isolation                                         | −60       |                | dB typ            | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 100\text{ kHz}$ ; see Figure 24                                  |
| Channel-to-Channel Crosstalk                          | −120      |                | dB typ            | S1A to S2A/S1B to S2B, $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 100\text{ kHz}$ ; see Figure 27           |
|                                                       | −60       |                | dB typ            | S1A to S1B/S2A to S2B, $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 100\text{ kHz}$ ; see Figure 25           |
| Total Harmonic Distortion, THD + N                    | 0.017     |                | % typ             | $R_L = 32\ \Omega$ , $f = 20\text{ Hz}$ to $20\text{ kHz}$ , $V_S = 3.5\text{ V p-p}$                            |
| Insertion Loss                                        | −0.03     |                | dB typ            | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; see Figure 26                                                         |
| −3 dB Bandwidth                                       | 18        |                | MHz typ           | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; see Figure 26                                                         |
| $C_S$ (Off)                                           | 103       |                | pF typ            |                                                                                                                  |
| $C_D$ , $C_S$ (On)                                    | 295       |                | pF typ            |                                                                                                                  |
| <b>POWER REQUIREMENTS</b>                             |           |                |                   |                                                                                                                  |
| $I_{DD}$                                              | 0.003     |                | $\mu\text{A}$ typ | $V_{DD} = 5.5\text{ V}$<br>Digital inputs = 0 V or 5.5 V                                                         |
|                                                       |           | 1              | $\mu\text{A}$ max |                                                                                                                  |

<sup>1</sup> Guaranteed by design, not production tested.

$V_{DD} = 3.4 \text{ V}$  to  $4.2 \text{ V}$ ;  $GND = 0 \text{ V}$ , unless otherwise noted.

Table 2.

| Parameter                                             | 25°C                   | −40°C to +85°C | Unit                                         | Test Conditions/Comments                                                                                              |
|-------------------------------------------------------|------------------------|----------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>ANALOG SWITCH</b>                                  |                        |                |                                              |                                                                                                                       |
| Analogue Signal Range                                 |                        | 0 to $V_{DD}$  | V                                            |                                                                                                                       |
| On Resistance, $R_{ON}$                               | 0.33<br>0.4            | 0.47           | $\Omega$ typ<br>$\Omega$ max                 | $V_{DD} = 3.4 \text{ V}$ , $V_S = 0 \text{ V}$ to $V_{DD}$ , $I_S = 100 \text{ mA}$<br>See Figure 18                  |
| On-Resistance Match Between Channels, $\Delta R_{ON}$ | 0.013                  |                | $\Omega$ typ                                 | $V_{DD} = 3.4 \text{ V}$ , $V_S = 2 \text{ V}$ , $I_S = 100 \text{ mA}$                                               |
| On-Resistance Flatness, $R_{FLAT}$ (On)               | 0.042<br>0.13<br>0.155 | 0.065<br>0.175 | $\Omega$ max<br>$\Omega$ typ<br>$\Omega$ max | $V_{DD} = 3.4 \text{ V}$ , $V_S = 0 \text{ V}$ to $V_{DD}$<br>$I_S = 100 \text{ mA}$                                  |
| <b>LEAKAGE CURRENTS</b>                               |                        |                |                                              |                                                                                                                       |
| Source Off Leakage, $I_S$ (Off)                       | $\pm 0.2$              |                | nA typ                                       | $V_{DD} = 4.2 \text{ V}$<br>$V_S = 0.6 \text{ V}/3.9 \text{ V}$ , $V_D = 3.9 \text{ V}/0.6 \text{ V}$ ; see Figure 19 |
| Channel On Leakage, $I_D$ , $I_S$ (On)                | $\pm 0.2$              |                | nA typ                                       | $V_S = V_D = 0.6 \text{ V}$ or $3.9 \text{ V}$ ; see Figure 20                                                        |
| <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<br>$\mu\text{A}$ max       | $V_{IN} = V_{INL}$ or $V_{INH}$                                                                                       |
| Digital Input Capacitance, $C_{IN}$                   | 2                      |                | pF typ                                       |                                                                                                                       |
| <b>DYNAMIC CHARACTERISTICS<sup>1</sup></b>            |                        |                |                                              |                                                                                                                       |
| $t_{ON}$                                              | 42<br>50               | 54             | ns typ<br>ns max                             | $R_L = 50 \Omega$ , $C_L = 35 \text{ pF}$<br>$V_S = 1.5 \text{ V}/0 \text{ V}$ ; see Figure 21                        |
| $t_{OFF}$                                             | 15<br>21               | 24             | ns typ<br>ns max                             | $R_L = 50 \Omega$ , $C_L = 35 \text{ pF}$<br>$V_S = 1.5 \text{ V}$ ; see Figure 21                                    |
| Break-Before-Make Time Delay, $t_{BBM}$               | 17                     | 10             | ns typ<br>ns min                             | $R_L = 50 \Omega$ , $C_L = 35 \text{ pF}$<br>$V_{S1} = V_{S2} = 1.5 \text{ V}$ ; see Figure 22                        |
| Charge Injection                                      | 100                    |                | pC typ                                       | $V_S = 1.5 \text{ V}$ , $R_S = 0 \Omega$ , $C_L = 1 \text{ nF}$ ; see Figure 23                                       |
| Off Isolation                                         | −60                    |                | dB typ                                       | $R_L = 50 \Omega$ , $C_L = 5 \text{ pF}$ , $f = 100 \text{ kHz}$ ; see Figure 24                                      |
| Channel-to-Channel Crosstalk                          | −120                   |                | dB typ                                       | S1A to S2A/S1B to S2B, $R_L = 50 \Omega$ , $C_L = 5 \text{ pF}$ , $f = 100 \text{ kHz}$ ; see Figure 27               |
|                                                       | −60                    |                | dB typ                                       | S1A to S1B/S2A to S2B, $R_L = 50 \Omega$ , $C_L = 5 \text{ pF}$ , $f = 100 \text{ kHz}$ ; see Figure 25               |
| Total Harmonic Distortion, THD + N                    | 0.01                   |                | % typ                                        | $R_L = 32 \Omega$ , $f = 20 \text{ Hz}$ to $20 \text{ kHz}$ , $V_S = 2 \text{ V}$ p-p                                 |
| Insertion Loss                                        | −0.03                  |                | dB typ                                       | $R_L = 50 \Omega$ , $C_L = 5 \text{ pF}$ ; see Figure 26                                                              |
| −3 dB Bandwidth                                       | 18                     |                | MHz typ                                      | $R_L = 50 \Omega$ , $C_L = 5 \text{ pF}$ ; see Figure 26                                                              |
| $C_S$ (Off)                                           | 110                    |                | pF typ                                       |                                                                                                                       |
| $C_D$ , $C_S$ (On)                                    | 300                    |                | pF typ                                       |                                                                                                                       |
| <b>POWER REQUIREMENTS</b>                             |                        |                |                                              |                                                                                                                       |
| $I_{DD}$                                              | 0.003                  | 1              | $\mu\text{A}$ typ<br>$\mu\text{A}$ max       | $V_{DD} = 4.2 \text{ V}$<br>Digital inputs = $0 \text{ V}$ or $4.2 \text{ V}$                                         |

<sup>1</sup> Guaranteed by design, not production tested.

$V_{DD} = 2.7\text{ V}$  to  $3.6\text{ V}$ ,  $GND = 0\text{ V}$ , unless otherwise noted.

**Table 3.**

| Parameter                                             | 25°C      | −40°C to +85°C | Unit              | Test Conditions/Comments                                                                                         |
|-------------------------------------------------------|-----------|----------------|-------------------|------------------------------------------------------------------------------------------------------------------|
| <b>ANALOG SWITCH</b>                                  |           |                |                   |                                                                                                                  |
| Analog Signal Range                                   |           | 0 to $V_{DD}$  | V                 |                                                                                                                  |
| On Resistance, $R_{ON}$                               | 0.4       |                | $\Omega$ typ      | $V_{DD} = 2.7\text{ V}$ , $V_S = 0\text{ V}$ to $V_{DD}$                                                         |
|                                                       | 0.51      | 0.61           | $\Omega$ max      | $I_S = 100\text{ mA}$ ; see Figure 18                                                                            |
| On-Resistance Match Between Channels, $\Delta R_{ON}$ | 0.02      |                | $\Omega$ typ      | $V_{DD} = 2.7\text{ V}$ , $V_S = 0.6\text{ V}$                                                                   |
|                                                       |           |                |                   |                                                                                                                  |
| On-Resistance Flatness, $R_{FLAT}$ (On)               | 0.07      | 0.1            | $\Omega$ max      | $I_S = 100\text{ mA}$                                                                                            |
|                                                       | 0.18      |                | $\Omega$ typ      | $V_{DD} = 2.7\text{ V}$ , $V_S = 0\text{ V}$ to $V_{DD}$                                                         |
|                                                       |           | 0.25           | $\Omega$ max      | $I_S = 100\text{ mA}$                                                                                            |
| <b>LEAKAGE CURRENTS</b>                               |           |                |                   |                                                                                                                  |
| Source Off Leakage, $I_S$ (Off)                       | $\pm 0.2$ |                | nA typ            | $V_{DD} = 3.6\text{ V}$<br>$V_S = 0.6\text{ V}/3.3\text{ V}$ , $V_D = 3.3\text{ V}/0.6\text{ V}$ ; see Figure 19 |
| Channel On Leakage, $I_D$ , $I_S$ (On)                | $\pm 0.2$ |                | nA typ            | $V_S = V_D = 0.6\text{ V}$ or $3.3\text{ V}$ ; see Figure 20                                                     |
| <b>DIGITAL INPUTS</b>                                 |           |                |                   |                                                                                                                  |
| Input High Voltage, $V_{INH}$                         |           | 1.3            | V min             |                                                                                                                  |
| Input Low Voltage, $V_{INL}$                          |           | 0.8            | V max             |                                                                                                                  |
| Input Current, $I_{INL}$ or $I_{INH}$                 | 0.005     |                | $\mu\text{A}$ typ | $V_{IN} = V_{INL}$ or $V_{INH}$                                                                                  |
|                                                       |           | $\pm 0.1$      | $\mu\text{A}$ max |                                                                                                                  |
| Digital Input Capacitance, $C_{IN}$                   | 2         |                | pF typ            |                                                                                                                  |
| <b>DYNAMIC CHARACTERISTICS<sup>1</sup></b>            |           |                |                   |                                                                                                                  |
| $t_{ON}$                                              | 42        |                | ns typ            | $R_L = 50\ \Omega$ , $C_L = 35\text{ pF}$                                                                        |
|                                                       | 56        | 62             | ns max            | $V_S = 1.5\text{ V}/0\text{ V}$ ; see Figure 21                                                                  |
| $t_{OFF}$                                             | 14        |                | ns typ            | $R_L = 50\ \Omega$ , $C_L = 35\text{ pF}$                                                                        |
|                                                       | 19        | 21             | ns max            | $V_S = 1.5\text{ V}$ ; see Figure 21                                                                             |
| Break-Before-Make Time Delay, $t_{BBM}$               | 24        |                | ns typ            | $R_L = 50\ \Omega$ , $C_L = 35\text{ pF}$                                                                        |
|                                                       |           | 10             | ns min            | $V_{S1} = V_{S2} = 1.5\text{ V}$ ; see Figure 22                                                                 |
| Charge Injection                                      | 85        |                | pC typ            | $V_S = 1.25\text{ V}$ , $R_S = 0\ \Omega$ , $C_L = 1\text{ nF}$ ; see Figure 23                                  |
| Off Isolation                                         | −60       |                | dB typ            | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 100\text{ kHz}$ ; see Figure 24                                  |
| Channel-to-Channel Crosstalk                          | −120      |                | dB typ            | $S1A$ to $S2A/S1B$ to $S2B$ , $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 100\text{ kHz}$ ; see Figure 27    |
|                                                       | −60       |                | dB typ            | $S1A$ to $S1B/S2A$ to $S2B$ , $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ , $f = 100\text{ kHz}$ ; see Figure 25    |
| Total Harmonic Distortion, THD + N                    | 0.03      |                | % typ             | $R_L = 32\ \Omega$ , $f = 20\text{ Hz}$ to $20\text{ kHz}$ , $V_S = 1.5\text{ V p-p}$                            |
| Insertion Loss                                        | −0.03     |                | dB typ            | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; see Figure 26                                                         |
| −3 dB Bandwidth                                       | 18        |                | MHz typ           | $R_L = 50\ \Omega$ , $C_L = 5\text{ pF}$ ; see Figure 26                                                         |
| $C_S$ (Off)                                           | 110       |                | pF typ            |                                                                                                                  |
| $C_D$ , $C_S$ (On)                                    | 300       |                | pF typ            |                                                                                                                  |
| <b>POWER REQUIREMENTS</b>                             |           |                |                   |                                                                                                                  |
| $I_{DD}$                                              | 0.003     |                | $\mu\text{A}$ typ | $V_{DD} = 3.6\text{ V}$<br>Digital inputs = $0\text{ V}$ or $3.6\text{ V}$                                       |
|                                                       |           | 1              | $\mu\text{A}$ max |                                                                                                                  |

<sup>1</sup> Guaranteed by design, not production tested.

## ABSOLUTE MAXIMUM RATINGS

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

Table 4.

| Parameter                                           | Rating                                                       |
|-----------------------------------------------------|--------------------------------------------------------------|
| $V_{DD}$ to GND                                     | –0.3 V to +6 V                                               |
| Analog Inputs, <sup>1</sup> Digital Inputs          | –0.3 V to $V_{DD} + 0.3$ V or 30 mA (whichever occurs first) |
| Peak Current, S or D                                | 600 mA (pulsed at 1 ms, 10% duty cycle maximum)              |
| Continuous Current, S or D                          | 400 mA                                                       |
| Operating Temperature Range                         | –40°C to +85°C                                               |
| Storage Temperature Range                           | –65°C to +150°C                                              |
| Junction Temperature                                | 150°C                                                        |
| 10-Lead MSOP, Thermal Impedance                     |                                                              |
| $\theta_{JA}$                                       | 206°C/W                                                      |
| $\theta_{JC}$                                       | 44°C/W                                                       |
| 10-Ball WLCSP (4-Layer Board), Thermal Impedance    |                                                              |
| $\theta_{JA}$                                       | 120°C/W                                                      |
| 10-Lead LFCSP_WD (4-Layer Board), Thermal Impedance |                                                              |
| $\theta_{JA}$                                       | 76°C/W                                                       |
| $\theta_{JC}$                                       | 13.5°C/W                                                     |
| Reflow Soldering (Pb-Free)                          |                                                              |
| Peak Temperature                                    | 260(+ 0 or –5)°C                                             |
| Time at Peak Temperature                            | 10 sec to 40 sec                                             |

<sup>1</sup> Overvoltages at IN, S, or D pins 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.

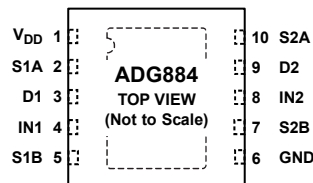
Only one absolute maximum rating can be applied at any one time.

### 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

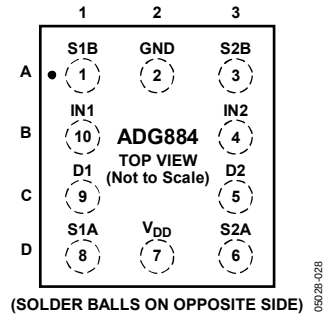


### NOTES

1. THE LFCSP\_WD PACKAGE HAS AN EXPOSED PAD THAT SHOULD BE TIED TO GROUND.

05028-002

Figure 2. LFCSP\_WD and MSOP Pin Configuration



(SOLDER BALLS ON OPPOSITE SIDE)

05028-028

Figure 3. WLCSP Pin Configuration

Table 5. LFCSP\_WD and MSOP Pin Function Descriptions

| Pin No. | Mnemonic        | Description                                                            |
|---------|-----------------|------------------------------------------------------------------------|
| 1       | V <sub>DD</sub> | Most Positive Power Supply Potential.                                  |
| 2       | S1A             | Source Terminal. Can be an input or output.                            |
| 3       | D1              | Drain Terminal. Can be an input or output.                             |
| 4       | IN1             | Logic Control Input.                                                   |
| 5       | S1B             | Source Terminal. Can be an input or output.                            |
| 6       | GND             | Ground (0 V) Reference.                                                |
| 7       | S2B             | Source Terminal. Can be an input or output.                            |
| 8       | IN2             | Logic Control Input.                                                   |
| 9       | D2              | Drain Terminal. Can be an input or output.                             |
| 10      | S2A             | Source Terminal. Can be an input or output.                            |
|         | EPAD            | The LFCSP_WD package has an exposed pad that should be tied to ground. |

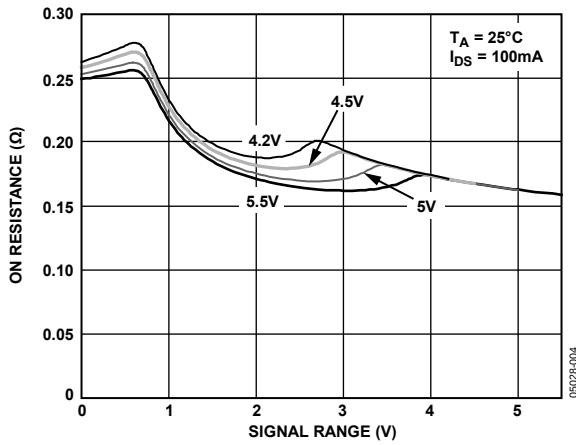
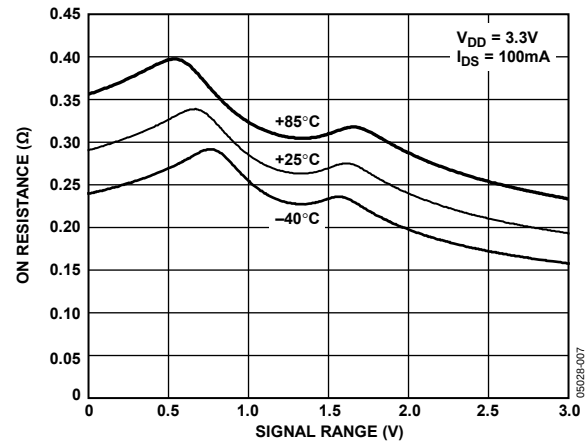
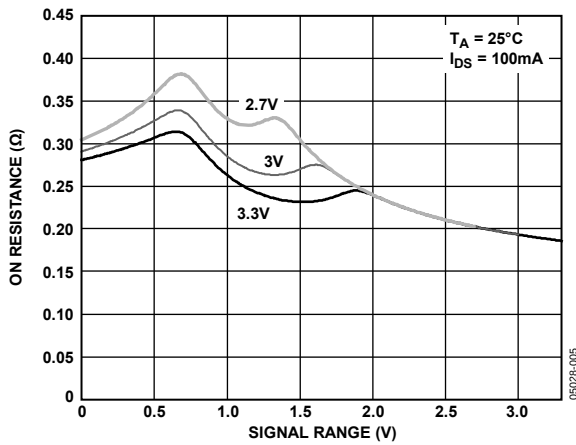
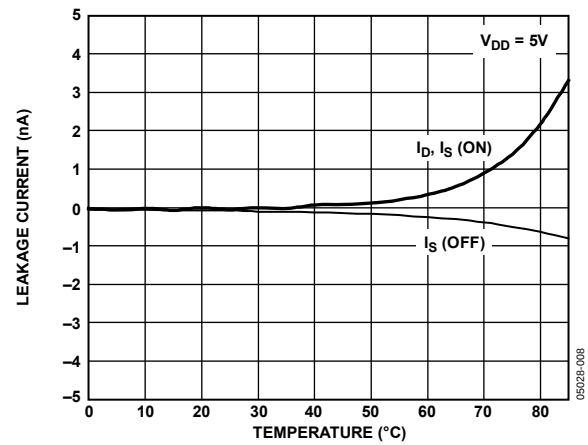
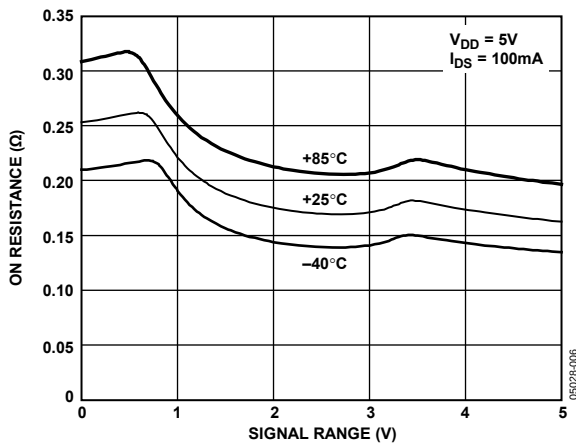
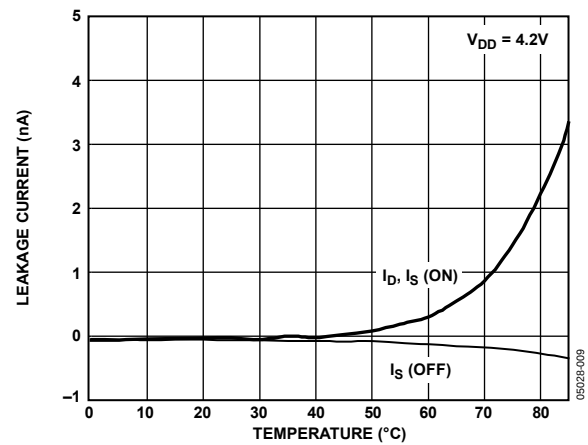
Table 6. WLCSP Package Pin Function Description

| WLCSP Package |          | Mnemonic        | Description                                 |
|---------------|----------|-----------------|---------------------------------------------|
| Ball Number   | Location |                 |                                             |
| 1             | A1       | S1B             | Source Terminal. Can be an input or output. |
| 2             | A2       | GND             | Ground (0 V) Reference.                     |
| 3             | A3       | S2B             | Source Terminal. Can be an input or output. |
| 4             | B3       | IN2             | Logic Control Input.                        |
| 5             | C3       | D2              | Drain Terminal. Can be an input or output.  |
| 6             | D3       | S2A             | Source Terminal. Can be an input or output. |
| 7             | D2       | V <sub>DD</sub> | Most Positive Power Supply Potential.       |
| 8             | D1       | S1A             | Source Terminal. Can be an input or output. |
| 9             | C1       | D1              | Drain Terminal. Can be an input or output.  |
| 10            | B1       | IN1             | Logic Control Input.                        |

Table 7. ADG884 Truth Table

| Logic (IN1/IN2) | Switch 1A/Switch 2A | Switch 1B/Switch 2B |
|-----------------|---------------------|---------------------|
| 0               | Off                 | On                  |
| 1               | On                  | Off                 |

## TYPICAL PERFORMANCE CHARACTERISTICS

Figure 4. On Resistance vs.  $V_D$  ( $V_S$ ),  $V_{DD} = 4.2$  V to 5.5 VFigure 7. On Resistance vs.  $V_D$  ( $V_S$ ) for Different Temperatures,  $V_{DD} = 3.3$  VFigure 5. On Resistance vs.  $V_D$  ( $V_S$ ),  $V_{DD} = 2.7$  V to 3.3 VFigure 8. Leakage Current vs. Temperature,  $V_{DD} = 5$  VFigure 6. On Resistance vs.  $V_D$  ( $V_S$ ) for Different Temperature,  $V_{DD} = 5$  VFigure 9. Leakage Current vs. Temperature,  $V_{DD} = 4.2$  V

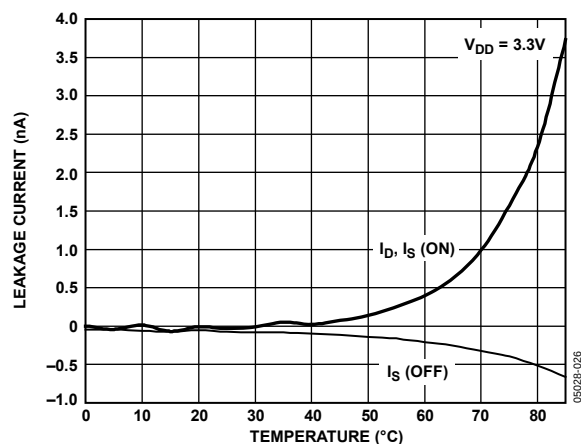
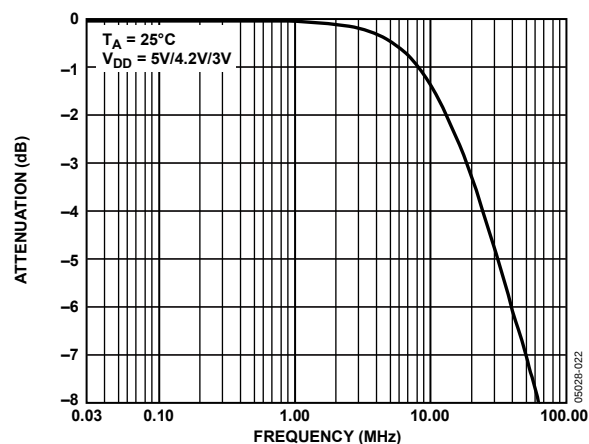
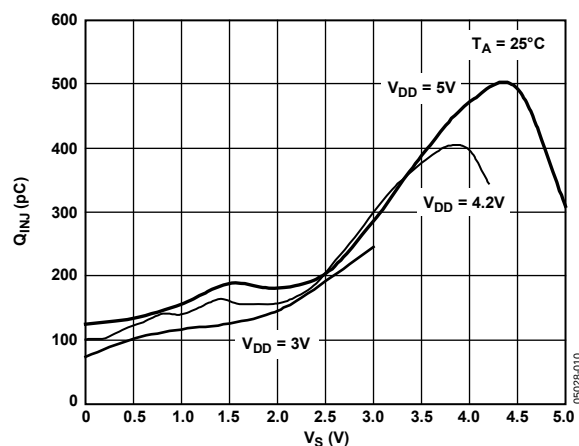
Figure 10. Leakage Current vs. Temperature,  $V_{DD} = 3.3V$ Figure 13. Bandwidth,  $V_{DD} = 5V/4.2V/3V$ 

Figure 11. Charge Injection vs. Source Voltage

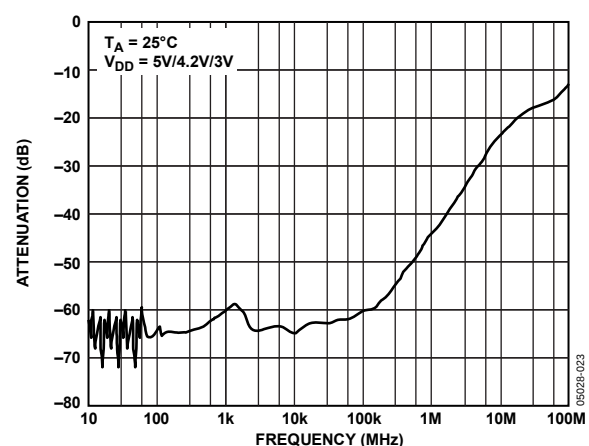


Figure 14. Off Isolation vs. Frequency

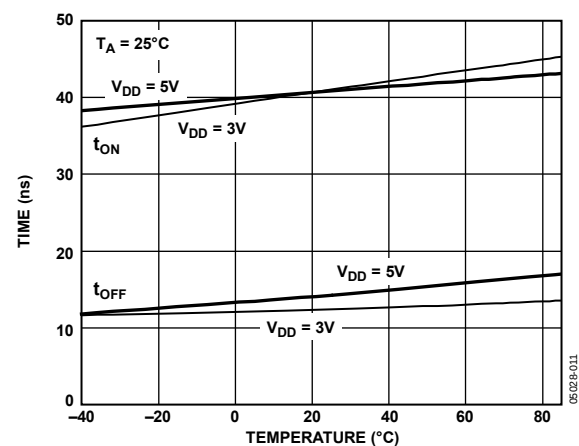
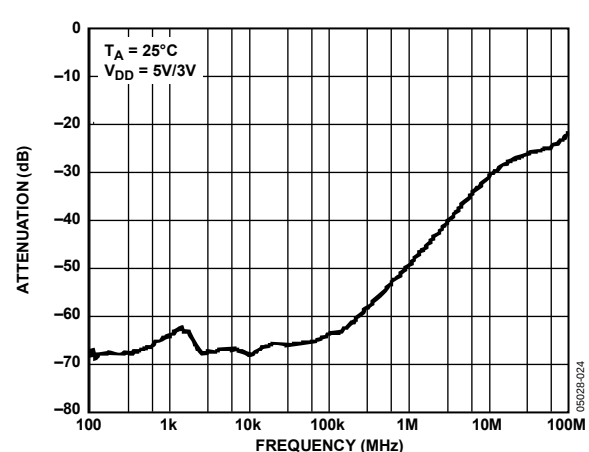
Figure 12.  $t_{ON}/t_{OFF}$  Times vs. Temperature

Figure 15. Crosstalk vs. Frequency

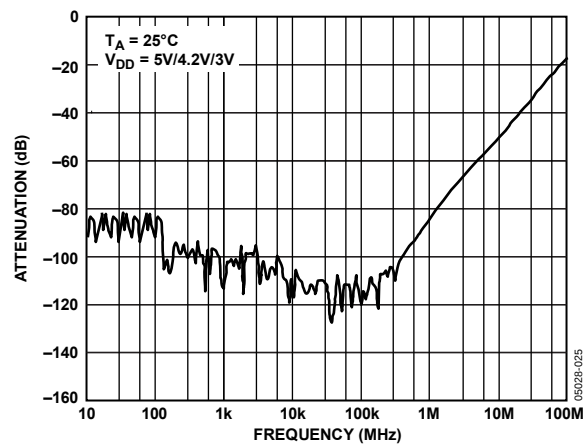


Figure 16. AC PSRR

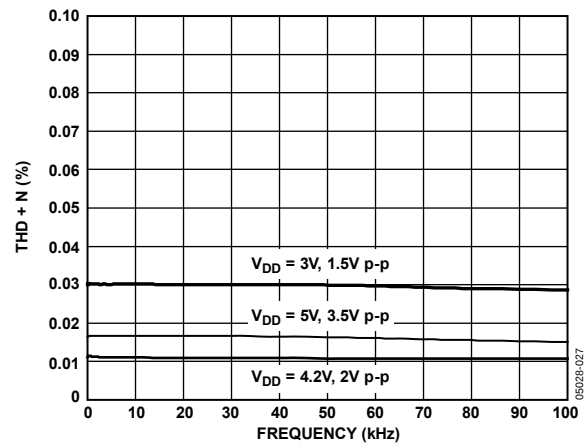


Figure 17. THD + N

## TEST CIRCUITS

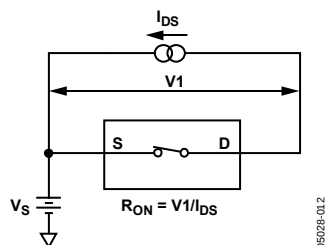


Figure 18. On Resistance

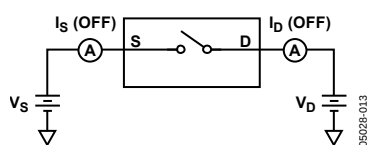


Figure 19. Off Leakage

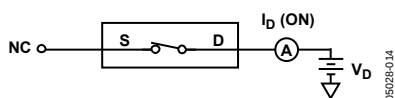
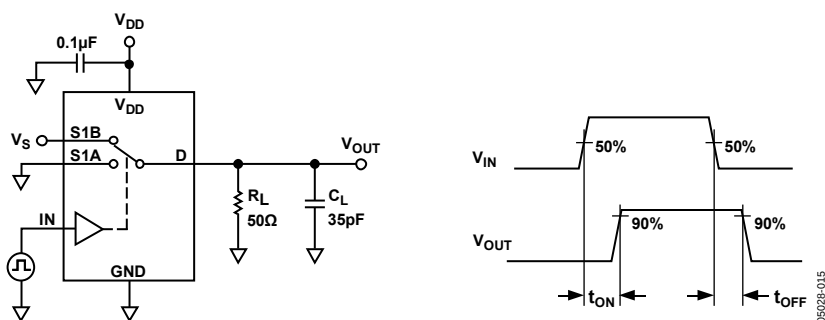
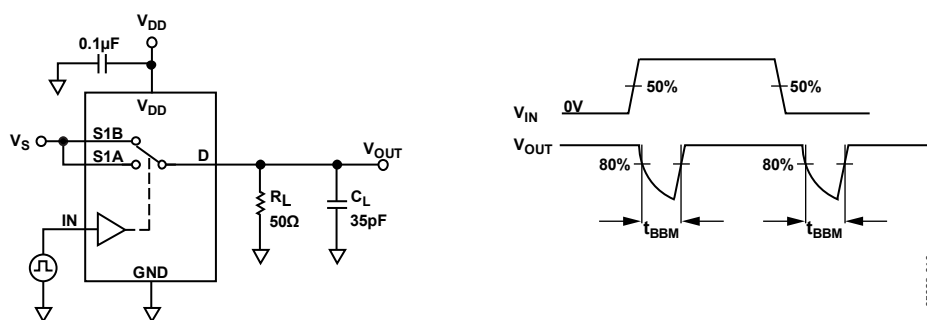


Figure 20. On Leakage

Figure 21. Switching Times,  $t_{ON}$ ,  $t_{OFF}$ Figure 22. Break-Before-Make Time Delay,  $t_{BBM}$

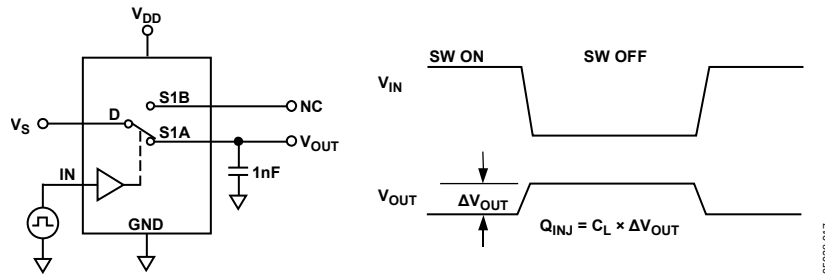


Figure 23. Charge Injection

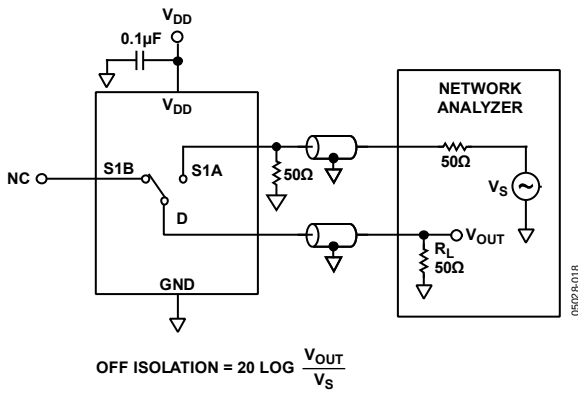


Figure 24. Off Isolation

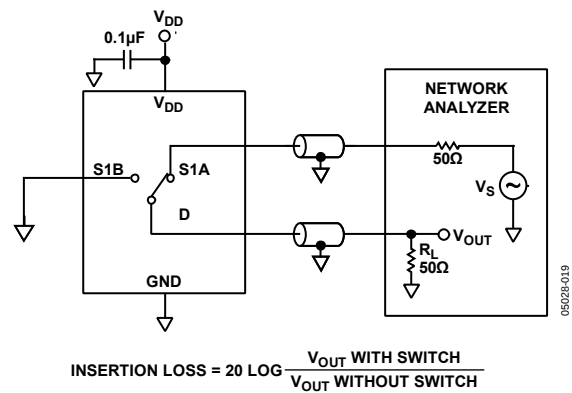


Figure 26. Bandwidth

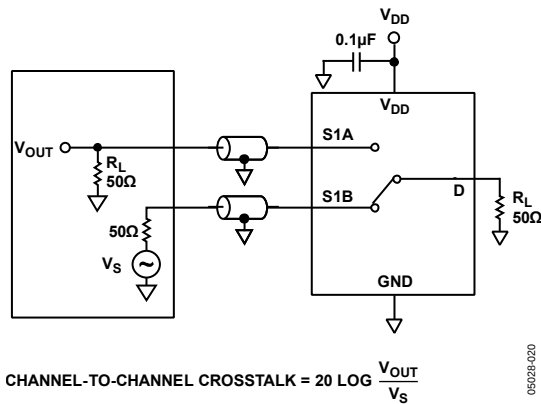


Figure 25. Channel-to-Channel Crosstalk (S1A to S1B)

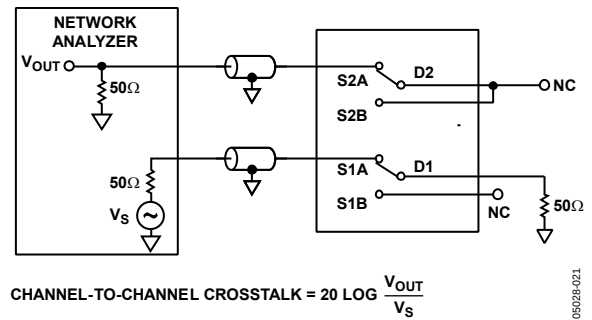


Figure 27. Channel-to-Channel Crosstalk (S1A to S2A)

## TERMINOLOGY

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

Positive supply current.

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

Analog voltage on Terminal D and Terminal S.

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

Ohmic resistance between Terminal D and Terminal S.

**R<sub>FLAT</sub> (On)**

The difference between the maximum and minimum values of on resistance as measured on the switch.

**ΔR<sub>ON</sub>**

On resistance match between any two channels.

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

Source leakage current with the switch off.

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

Drain leakage current with the switch off.

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

Channel leakage current with the switch on.

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

Maximum input voltage for Logic 0.

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

Minimum input voltage for Logic 1.

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

Input current of the digital input.

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

Off switch source capacitance. Measured with reference to ground.

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

Off switch drain capacitance. Measured with reference to ground.

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

On switch capacitance. Measured with reference to ground.

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

Digital input capacitance.

**t<sub>ON</sub>**

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

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

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

**t<sub>BBM</sub>**

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

**Charge Injection**

Measure of the glitch impulse transferred from the digital input to the analog output during on/off switching.

**Off Isolation**

Measure of unwanted signal coupling through an off switch.

**Crosstalk**

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

**–3 dB Bandwidth**

Frequency at which the output is attenuated by 3 dB.

**On Response**

Frequency response of the on switch.

**Insertion Loss**

The loss due to the on resistance of the switch.

**Total Harmonic Distortion + Noise (THD + N)**

Ratio of the harmonics amplitude plus noise of a signal to the fundamental.

## OUTLINE DIMENSIONS

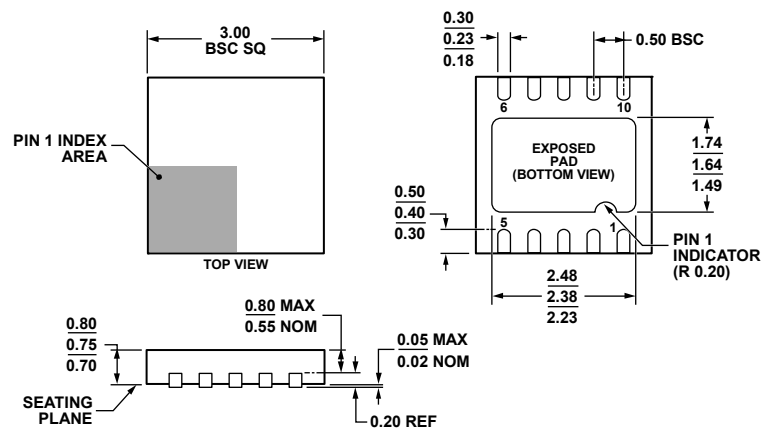
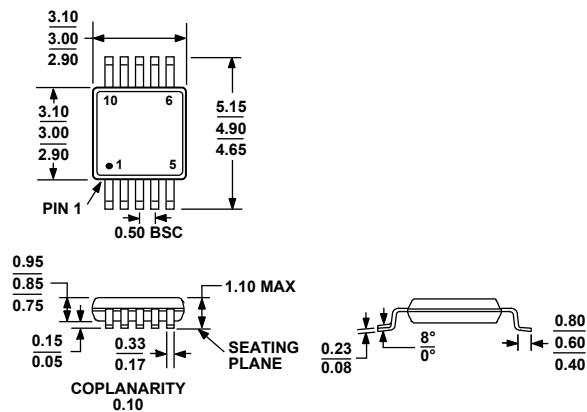


Figure 28. 10-Lead Lead Frame Chip Scale Package [LFCSP\_WD]  
3 mm x 3 mm Body, Very Very Thin, Dual Lead  
(CP-10-9)  
Dimensions shown in millimeters

031208-B



COMPLIANT TO JEDEC STANDARDS MO-187-BA

Figure 29. 10-Lead Mini Small Outline Package [MSOP]  
(RM-10)  
Dimensions shown in millimeters

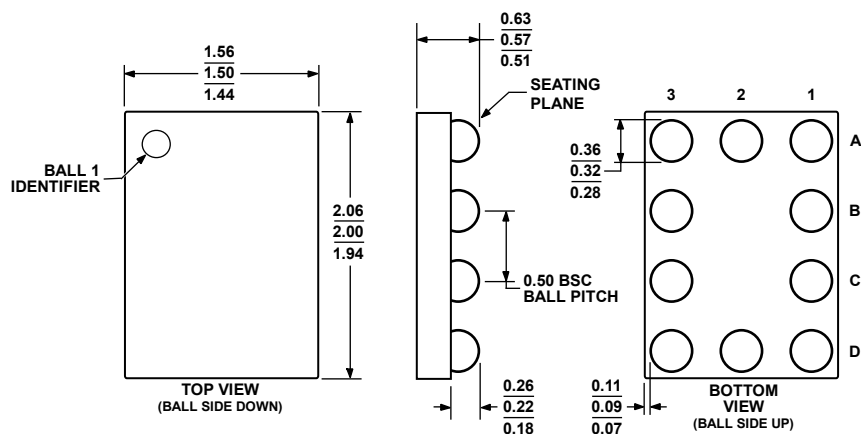


Figure 30. 10-Ball Wafer Level Chip Scale Package [WLCSP]  
(CB-10)

Dimensions shown in millimeters

## ORDERING GUIDE

| Model <sup>1</sup> | Temperature Range | Package Description                              | Package Option | Branding <sup>2</sup> |
|--------------------|-------------------|--------------------------------------------------|----------------|-----------------------|
| ADG884BRMZ         | –40°C to +85°C    | 10-Lead Mini Small Outline Package [MSOP]        | RM-10          | S9C                   |
| ADG884BRMZ-REEL    | –40°C to +85°C    | 10-Lead Mini Small Outline Package [MSOP]        | RM-10          | S9C                   |
| ADG884BRMZ-REEL7   | –40°C to +85°C    | 10-Lead Mini Small Outline Package [MSOP]        | RM-10          | S9C                   |
| ADG884BCPZ-REEL    | –40°C to +85°C    | 10-Lead Lead Frame Chip Scale Package [LFCSP_WD] | CP-10-9        | S9C                   |
| ADG884BCPZ-REEL7   | –40°C to +85°C    | 10-Lead Lead Frame Chip Scale Package [LFCSP_WD] | CP-10-9        | S9C                   |
| ADG884BCBZ-REEL    | –40°C to +85°C    | 10-Ball Wafer Level Chip Scale Package [WLCSP]   | CB-10          | S9C                   |
| ADG884BCBZ-REEL7   | –40°C to +85°C    | 10-Ball Wafer Level Chip Scale Package [WLCSP]   | CB-10          | S9C                   |
| EVAL-ADG884EBZ     |                   | Evaluation Board                                 |                |                       |

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

<sup>2</sup> Branding on this package is limited to three characters due to space constraints.

**NOTES**