

FEATURES

Ultralow on resistance
0.28 Ω typical
0.48 Ω max at 125°C
Excellent audio performance, ultralow distortion
0.025 Ω typical
0.052 Ω max RON flatness
1.65 V to 3.6 V single supply
High current carrying capability
300 mA continuous current
500 mA peak current
Automotive temperature range: -40°C to +125°C
Rail-to-rail operation
Typical power consumption (<0.01 μ W)
Known good die (KGD): these die are fully guaranteed to
data sheet specifications

APPLICATIONS

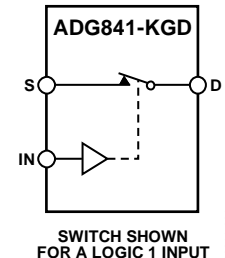
Handsets
PDA's
MP3 players
Power routing
Battery-powered systems
Communication systems
Modems
PCMCIA cards

GENERAL DESCRIPTION

The [ADG841-KGD](#) is a low voltage CMOS device containing a single-pole, single-throw (SPST) switch. The [ADG841-KGD](#) is closed for a Logic 1 input. The device offers ultralow on resistance of less than 0.48 Ω over the full temperature range. The [ADG841-KGD](#) is fully specified for 3.3 V, 2.5 V, and 1.8 V supply operation.

Each switch conducts equally well in both directions when on, and has an input signal range that extends to the supplies.

Additional application and technical information can be found in the [ADG841](#) data sheet.

FUNCTIONAL BLOCK DIAGRAM

Figure 1.
PRODUCT HIGHLIGHTS

1. <0.48 Ω over full temperature range of -40°C to +125°C.
2. Compatible with 1.8 V CMOS logic.
3. High current handling capability (300 mA continuous current at 3.3 V).
4. Low THD + N (0.02% typical).

Table 1. [ADG841-KGD](#) Truth Table

Logic (IN)	ADG841-KGD
0	Off
1	On

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REVISION HISTORY

12/14—Rev. A to Rev. B

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10/14—Rev. 0 to Rev. A

Changes to Test Circuits Section Layout	8
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11/11—Revision 0: Initial Version

SPECIFICATIONS—2.7 V TO 3.6 V

$V_{DD} = 2.7\text{ V to }3.6\text{ V}$, $GND = 0\text{ V}$, unless otherwise noted. The temperature range is $-40^{\circ}\text{C to }+125^{\circ}\text{C}$.

Table 2.

Parameter	+25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 V to V_{DD}	V	$V_{DD} = 2.7\text{ V}$
On Resistance (R_{ON})	0.28			Ω typ	$V_{DD} = 2.7\text{ V}$, $V_S = 0\text{ V to }V_{DD}$, $I_{DS} = -100\text{ mA}$
	0.37	0.43	0.48	Ω max	See Figure 3
On Resistance Flatness ($R_{FLAT(ON)}$)	0.025			Ω typ	$V_{DD} = 2.7\text{ V}$, $V_S = 0\text{ V to }V_{DD}$, $I_{DS} = -100\text{ mA}$
	0.034	0.044	0.052	Ω max	
LEAKAGE CURRENTS					
Source Off Leakage I_S (OFF)	± 0.2			nA typ	$V_{DD} = 3.6\text{ V}$ $V_S = 0.6\text{ V}/3.3\text{ V}$, $V_D = 3.3\text{ V}/0.6\text{ V}$; see Figure 4
Channel On Leakage I_D , I_S (ON)	± 0.2			nA typ	$V_S = V_D = 0.6\text{ V or }3.3\text{ V}$; see Figure 5
DIGITAL INPUTS					
Input High Voltage, V_{INH}			2	V min	$V_{IN} = V_{INL}$ or V_{INH}
Input Low Voltage, V_{INL}			0.8	V max	
Input Current, I_{INL} or I_{INH}	0.005			μA typ	
			± 0.1	μA max	
Digital Input Capacitance, C_{IN}	3.2			pF typ	
DYNAMIC CHARACTERISTICS¹					
t_{ON}	10.5			ns typ	$R_L = 50\ \Omega$, $C_L = 35\text{ pF}$
	14	15.5	16.5	ns max	$V_S = 1.5\text{ V}$; see Figure 8
t_{OFF}	6.5			ns typ	$R_L = 50\ \Omega$, $C_L = 35\text{ pF}$
	7.8	8	8.2	ns max	$V_S = 1.5\text{ V}$; see Figure 8
Charge Injection	200			pC typ	$V_S = 1.5\text{ V}$, $R_S = 0\ \Omega$, $C_L = 1\text{ nF}$; see Figure 9
Off Isolation	-54			dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 100\text{ kHz}$; see Figure 6
Total Harmonic Distortion (THD + N)	0.012			%	$R_L = 32\ \Omega$, $f = 20\text{ Hz to }20\text{ kHz}$, $V_S = 3\text{ V p-p}$
Insertion Loss	-0.02			dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$; see Figure 7
-3 dB Bandwidth	21			MHz typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$; see Figure 7
C_S (OFF)	160			pF typ	
C_D (OFF)	160			pF typ	
C_D , C_S (ON)	238			pF typ	
POWER REQUIREMENTS					
I_{DD}	0.003			μA typ	$V_{DD} = 3.6\text{ V}$ Digital inputs = 0 V or 3.6 V
		1	4	μA max	

¹ Guaranteed by design; not subject to production test.

SPECIFICATIONS—2.5 V ± 0.2 V

$V_{DD} = 2.5 \text{ V} \pm 0.2 \text{ V}$, $GND = 0 \text{ V}$, unless otherwise noted. The temperature range is -40°C to $+125^\circ\text{C}$.

Table 3.

Parameter	+25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 V to V_{DD}	V	
On Resistance (R_{ON})	0.3			Ω typ	$V_{DD} = 2.3 \text{ V}$, $V_S = 0 \text{ V}$ to V_{DD} , $I_{DS} = -100 \text{ mA}$
	0.35	0.4	0.45	Ω max	See Figure 3
On Resistance Flatness ($R_{FLAT(ON)}$)	0.025			Ω typ	$V_{DD} = 2.3 \text{ V}$, $V_S = 0 \text{ V}$ to V_{DD} , $I_{DS} = -100 \text{ mA}$
	0.04	0.05	0.05	Ω max	
LEAKAGE CURRENTS					
Source Off Leakage I_S (OFF)	± 0.2			nA typ	$V_{DD} = 2.7 \text{ V}$
Channel On Leakage I_D , I_S (ON)	± 0.2			nA typ	$V_S = 0.6 \text{ V}/2.4 \text{ V}$, $V_D = 2.4 \text{ V}/0.6 \text{ V}$; see Figure 4
DIGITAL INPUTS					
Input High Voltage, V_{INH}			1.7	V min	
Input Low Voltage, V_{INL}			0.7	V max	
Input Current, I_{INL} or I_{INH}	0.005			μA typ	$V_{IN} = V_{INL}$ or V_{INH}
			± 0.1	μA max	
Digital Input Capacitance, C_{IN}	3.2			pF typ	
DYNAMIC CHARACTERISTICS¹					
t_{ON}	13			ns typ	$R_L = 50 \Omega$, $C_L = 35 \text{ pF}$
	16.5	18	19	ns max	$V_S = 1.5 \text{ V}$; see Figure 8
t_{OFF}	7			ns typ	$R_L = 50 \Omega$, $C_L = 35 \text{ pF}$
	8.2	8.4	8.6	ns max	$V_S = 1.5 \text{ V}$; see Figure 8
Charge Injection	150			pC typ	$V_S = 1.25 \text{ V}$, $R_S = 0 \Omega$, $C_L = 1 \text{ nF}$; see Figure 9
Off Isolation	-54			dB typ	$R_L = 50 \Omega$, $C_L = 5 \text{ pF}$, $f = 100 \text{ kHz}$; see Figure 6
Total Harmonic Distortion (THD + N)	0.022			%	$R_L = 32 \Omega$, $f = 20 \text{ Hz}$ to 20 kHz , $V_S = 1.5 \text{ V}$ p-p
Insertion Loss	-0.02			dB typ	$R_L = 50 \Omega$, $C_L = 5 \text{ pF}$; see Figure 7
-3 dB Bandwidth	21			MHz typ	$R_L = 50 \Omega$, $C_L = 5 \text{ pF}$; see Figure 7
C_S (OFF)	170			pF typ	
C_D (OFF)	170			pF typ	
C_D , C_S (ON)	238			pF typ	
POWER REQUIREMENTS					
I_{DD}	0.003			μA typ	$V_{DD} = 2.7 \text{ V}$
		1	4	μA max	Digital inputs = 0 V or 2.7 V

¹ Guaranteed by design; not subject to production test.

SPECIFICATIONS—1.65 V TO 1.95

V_{DD} = 1.65 V to 1.95 V, GND = 0 V, unless otherwise noted. The temperature range is -40°C to $+125^{\circ}\text{C}$.

Table 4.

Parameter	+25°C	-40°C to +85°C	-40°C to +125°C	Unit	Test Conditions/Comments
ANALOG SWITCH					
Analog Signal Range			0 V to V_{DD}	V	
On Resistance (R_{ON})	0.37			Ω typ	$V_{DD} = 1.8\text{ V}$, $V_S = 0\text{ V to }V_{DD}$, $I_{DS} = -100\text{ mA}$ See Figure 3
	0.4	0.84	0.84	Ω max	
	0.6	1.8	1.8	Ω max	$V_{DD} = 1.65\text{ V}$, $V_S = 0\text{ V to }V_{DD}$, $I_{DS} = -100\text{ mA}$
On Resistance Flatness ($R_{FLAT(ON)}$)	0.17			Ω typ	$V_{DD} = 1.65\text{ V}$, $V_S = 0\text{ V to }V_{DD}$, $I_{DS} = -100\text{ mA}$
LEAKAGE CURRENTS					
Source Off Leakage I_S (OFF)	± 0.2			nA typ	$V_{DD} = 1.95\text{ V}$ $V_S = 0.6\text{ V}/1.65\text{ V}$, $V_D = 1.65\text{ V}/0.6\text{ V}$; see Figure 4
Channel On Leakage I_D , I_S (ON)	± 0.2			nA typ	$V_S = V_D = 0.6\text{ V}$ or 1.65 V ; see Figure 5
DIGITAL INPUTS					
Input High Voltage, V_{INH}			$0.65 V_{DD}$	V min	
Input Low Voltage, V_{INL}			$0.35 V_{DD}$	V max	
Input Current, I_{INL} or I_{INH}	0.005			μA typ	$V_{IN} = V_{INL}$ or V_{INH}
			± 0.1	μA max	
Digital Input Capacitance, C_{IN}	4			pF typ	
DYNAMIC CHARACTERISTICS¹					
t_{ON}	19			ns typ	$R_L = 50\ \Omega$, $C_L = 35\text{ pF}$
	26	28	30	ns max	$V_S = 1.5\text{ V}$; see Figure 8
t_{OFF}	8			ns typ	$R_L = 50\ \Omega$, $C_L = 35\text{ pF}$
	9.5	9.8	10	ns max	$V_S = 1.5\text{ V}$; see Figure 8
Charge Injection	100			pC typ	$V_S = 1\text{ V}$, $R_S = 0\text{ V}$, $C_L = 1\text{ nF}$; see Figure 9
Off Isolation	-54			dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$, $f = 100\text{ kHz}$; see Figure 6
Total Harmonic Distortion (THD + N)	0.14			%	$R_L = 32\ \Omega$, $f = 20\text{ Hz to }20\text{ kHz}$, $V_S = 1.2\text{ V p-p}$
Insertion Loss	-0.02			dB typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$; see Figure 7
-3 dB Bandwidth	21			MHz typ	$R_L = 50\ \Omega$, $C_L = 5\text{ pF}$; see Figure 7
C_S (OFF)	178			pF typ	
C_D (OFF)	178			pF typ	
C_D , C_S (ON)	238			pF typ	
POWER REQUIREMENTS					
I_{DD}	0.003			μA typ	$V_{DD} = 1.95\text{ V}$ Digital inputs = 0 V or 1.95 V
		1	4	μA max	

¹ 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 GND	-0.3 V to +4.6 V
Analog Inputs ¹	-0.3 V to $V_{DD} + 0.3$ V
Digital Inputs ¹	-0.3 V to 4.6 V or 10 mA, whichever occurs first
Peak Current, S or D	
3.3 V Operation	500 mA
2.5 V Operation	460 mA
1.8 V Operation	420 mA (pulsed at 1 ms, 10% duty cycle maximum)
Continuous Current, S or D	
3.3 V Operation	300 mA
2.5 V Operation	275 mA
1.8 V Operation	250 mA
Operating Temperature Range	-40°C to +125°C
Storage Temperature Range	-65°C to +150°C
Junction Temperature	150°C

¹ Overvoltages at S or D are clamped by internal diodes. Current should be limited to the maximum ratings given.

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

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 CONFIGURATION AND FUNCTION DESCRIPTIONS

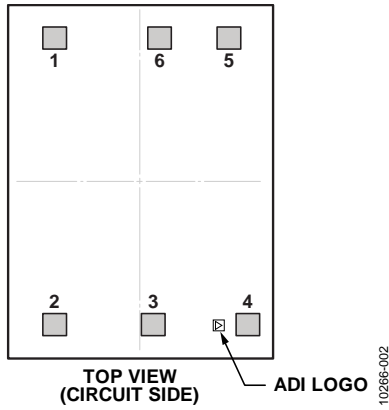


Figure 2. Pad Configuration

Table 6. Pad Function Descriptions

Pad No.	X-Axis (μm)	Y-Axis (μm)	Mnemonic	Pad Type	Description
1	-254	+401	V _{DD}	Single	Positive Power Supply Pad.
2	-254	-401	IN	Single	Logic Control Input Pad.
3	+6	-401	S	Single	Source Pad.
4	+306	-401	GND	Single	Ground Pad.
5	+249	+401	NC	Single	No Connect.
6	+39	+401	D	Single	Drain Pad.

TEST CIRCUITS

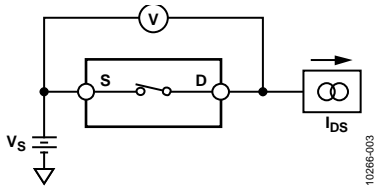


Figure 3. On Resistance

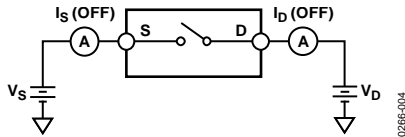


Figure 4. Off Leakage

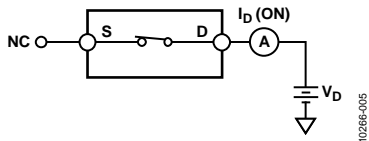
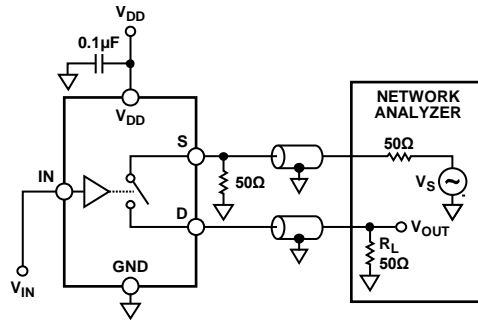
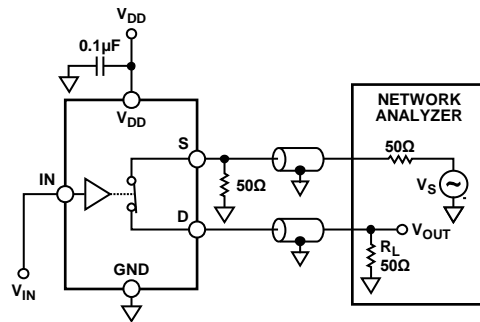


Figure 5. On Leakage



ADG841-KGD - $V_{IN} = 0$
 OFF ISOLATION = $20 \log \frac{V_{OUT}}{V_S}$

Figure 6. Off Isolation



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

Figure 7. Bandwidth

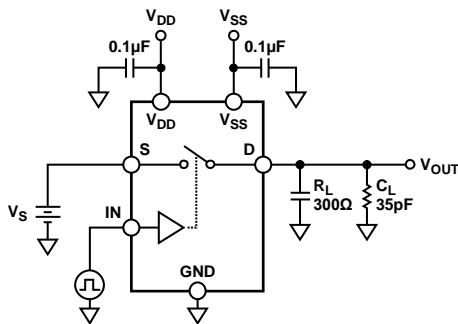


Figure 8. Switching Times, t_{ON} , t_{OFF}

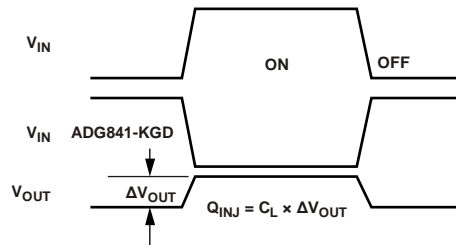
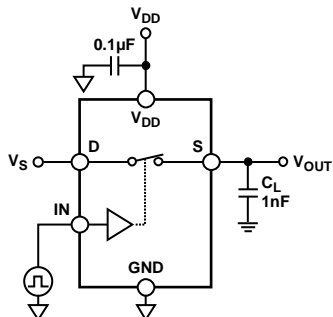
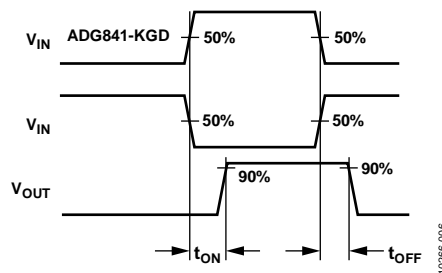


Figure 9. Charge Injection

OUTLINE DIMENSIONS

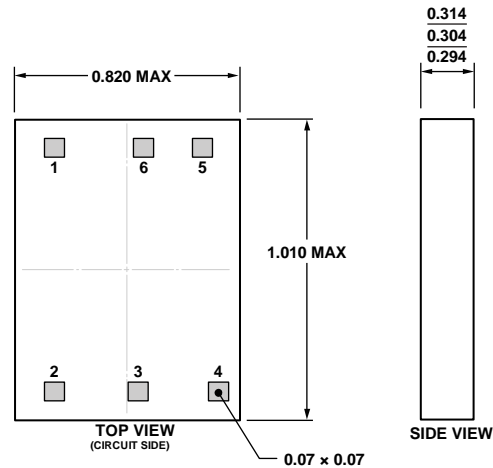


Figure 10. 6-Pad Bare Die [CHIP]
(C-6-3)
Dimensions shown in millimeters

11-04-2011-A

DIE SPECIFICATIONS AND ASSEMBLY RECOMMENDATIONS

Table 7. Die Specifications

Parameter	Value	Unit
Chip Size	735 × 925	µm
Scribe Line Width	85 × 85	µm
Die Size	820 × 1010	µm (maximum)
Thickness	304 ± 10	µm
Bond Pad	70 × 70	µm (minimum)
Bond Pad Composition	99.5 Al, 0.5 Cu	%
Backside	Bare	Not Applicable
Passivation	Nitride	Not Applicable

Table 8. Assembly Recommendations

Assembly Component	Recommendation
Die Attach	Epoxy adhesive
Bonding Method	Gold ball or aluminum wedge
Bonding Sequence	Four first

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
ADG841-KGD-CHIPS	-40°C to +125°C	6-Pad Bare Die [CHIP]	C-6-3

Mouser Electronics

Authorized Distributor

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[ADG841YKSZ-REEL7](#) [ADG842YKSZ-500RL7](#) [ADG841YKSZ-500RL7](#) [ADG842YKSZ-REEL7](#) [EVAL-6SC70EBZ](#)