



钜地半导体
Tudi Semiconductor

Product Specification

TUDI-AD8656

Low Noise, Precision CMOS Amplifier

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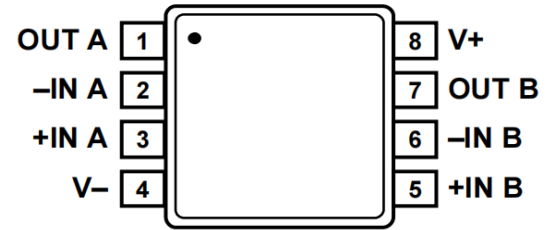
**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



FEATURES

Low noise: $2.7 \text{ nV}/\sqrt{\text{Hz}}$ at $f = 10 \text{ kHz}$
Low offset voltage: $250 \text{ }\mu\text{V}$ max over V_{CM}
Offset voltage drift: $0.4 \text{ }\mu\text{V}/^{\circ}\text{C}$ typ and $2.3 \text{ }\mu\text{V}/^{\circ}\text{C}$ max
Bandwidth: 28 MHz
Rail-to-rail input/output
Unity gain stable
 2.7 V to 5.5 V operation
 -40°C to $+125^{\circ}\text{C}$ operation
Qualified for automotive applications



8-Lead SOIC (R-8)

APPLICATIONS

ADC and DAC buffers
Audio
Industrial controls
Precision filters
Digital scales
Automotive collision avoidance
PLL filters

GENERAL DESCRIPTION

The AD8655/AD8656 are the industry 's lowest noise, precision CMOS amplifiers. They leverage the Analog Devices DigiTrim® technology to achieve high dc accuracy. The AD8655/AD8656 provide low noise ($2.7 \text{ nV}/\sqrt{\text{Hz}}$ at 10 kHz), low THD + N (0.0007%), and high precision performance ($250 \text{ }\mu\text{V}$ max over V_{CM}) to low voltage applications. The ability to swing rail-to-rail at the input and output enables designers to buffer analog-to-digital converters (ADCs) and other wide dynamic range devices in single-supply systems. The high precision performance of the AD8655/AD8656 improves the resolution and dynamic range in low voltage applications. Audio applications, such as microphone pre-amps and audio mixing consoles, benefit from the low noise, low distortion, and high output current capability of the AD8655/AD8656 to reduce system level noise performance and maintain audio fidelity. The high precision and rail-to-rail input and output of the AD8655/AD8656 benefit data acquisition, process controls, and PLL filter applications. The AD8655/AD8656 are fully specified over the -40°C to $+125^{\circ}\text{C}$ temperature range. The AD8655/AD8656 are available in Pb-free, 8-lead MSOP and SOIC packages. The AD8655/AD8656 are both available for automotive applications.



SPECIFICATIONS

$V_S = 5.0\text{ V}$, $V_{CM} = V_S/2$, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Table 1.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$V_{CM} = 0\text{ V to } 5\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		50	250	μV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		0.4	550	$\mu\text{V}/^\circ\text{C}$
Input Bias Current	I_B	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		1	2.3	$\mu\text{V}/^\circ\text{C}$
Input Offset Current	I_{OS}	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$			10	pA
Input Voltage Range		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$			500	pA
Common-Mode Rejection Ratio	CMRR	$V_{CM} = 0\text{ V to } 5\text{ V}$	0		10	pA
Large Signal Voltage Gain	A_{VO}	$V_O = 0.2\text{ V to } 4.8\text{ V}$, $R_L = 10\text{ k}\Omega$, $V_{CM} = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	85	100	500	pA
			100	110	5	V
			95			dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$I_L = 1\text{ mA}$; $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	4.97	4.991		V
Output Voltage Low	V_{OL}	$I_L = 1\text{ mA}$; $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		8	30	mV
Output Current	I_{OUT}	$V_{OUT} = \pm 0.5\text{ V}$		± 220		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = 2.7\text{ V to } 5.0\text{ V}$	88	105		dB
Supply Current/Amplifier	I_{SY}	$V_O = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		3.7	4.5	mA
					5.3	mA
INPUT CAPACITANCE						
Differential	C_{IN}			9.3		pF
Common-Mode				16.7		pF
NOISE PERFORMANCE						
Input Voltage Noise Density	e_n	$f = 1\text{ kHz}$ $f = 10\text{ kHz}$		4		$\text{nV}/\sqrt{\text{Hz}}$
Total Harmonic Distortion + Noise	THD + N	$G = 1$, $R_L = 1\text{ k}\Omega$, $f = 1\text{ kHz}$, $V_{IN} = 2\text{ V p-p}$		2.7		$\text{nV}/\sqrt{\text{Hz}}$
				0.0007		%
FREQUENCY RESPONSE						
Gain Bandwidth Product	GBP			28		MHz
Slew Rate	SR	$R_L = 10\text{ k}\Omega$		11		$\text{V}/\mu\text{s}$
Settling Time	t_s	To 0.1%, $V_{IN} = 0\text{ V to } 2\text{ V step}$, $G = +1$		370		ns
Phase Margin		$C_L = 0\text{ pF}$		69		degrees



$V_S = 2.7\text{ V}$, $V_{CM} = V_S/2$, $T_A = 25^\circ\text{C}$, unless otherwise specified.

Table 2.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$V_{CM} = 0\text{ V to } 2.7\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		44	250 550	μV μV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		0.4	2.0	$\mu\text{V}/^\circ\text{C}$
Input Bias Current	I_B	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		1	10	pA
Input Offset Current	I_{OS}	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$			500	pA
Input Voltage Range		$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$			10	pA
Common-Mode Rejection Ratio	CMRR	$V_{CM} = 0\text{ V to } 2.7\text{ V}$	0		500	pA
Large Signal Voltage Gain	A_{VO}	$V_O = 0.2\text{ V to } 2.5\text{ V}$, $R_L = 10\text{ k}\Omega$, $V_{CM} = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	80	98	2.7	V
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$I_L = 1\text{ mA}$; $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	2.67	2.688		V
Output Voltage Low	V_{OL}	$I_L = 1\text{ mA}$; $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		10	30	mV
Output Current	I_{OUT}	$V_{OUT} = \pm 0.5\text{ V}$		± 75		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = 2.7\text{ V to } 5.0\text{ V}$	88	105		dB
Supply Current/Amplifier	I_{SY}	$V_O = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		3.7	4.5 5.3	mA mA
INPUT CAPACITANCE						
Differential	C_{IN}			9.3		pF
Common-Mode				16.7		pF
NOISE PERFORMANCE						
Input Voltage Noise Density	e_n	$f = 1\text{ kHz}$ $f = 10\text{ kHz}$		4.0 2.7		$\text{nV}/\sqrt{\text{Hz}}$ $\text{nV}/\sqrt{\text{Hz}}$
Total Harmonic Distortion + Noise	THD + N	$G = 1$, $R_L = 1\text{ k}\Omega$, $f = 1\text{ kHz}$, $V_{IN} = 2\text{ V p-p}$		0.0007		%
FREQUENCY RESPONSE						
Gain Bandwidth Product	GBP			27		MHz
Slew Rate	SR	$R_L = 10\text{ k}\Omega$		8.5		$\text{V}/\mu\text{s}$
Settling Time	t_s	To 0.1%, $V_{IN} = 0\text{ to } 1\text{ V step}$, $G = +1$		370		ns
Phase Margin		$C_L = 0\text{ pF}$		54		degrees



ABSOLUTE MAXIMUM RATINGS

Table 3.

Parameter	Rating
Supply Voltage	6 V
Input Voltage	VSS – 0.3 V to VDD + 0.3 V
Differential Input Voltage	±6 V
Output Short-Circuit Duration to GND	Indefinite
Electrostatic Discharge (HBM)	3.0 kV
Storage Temperature Range R, RM Packages	–65°C to +150°C
Junction Temperature Range R, RM Packages	–65°C to +150°C
Lead Temperature (Soldering, 10 sec)	260°C

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.

Table 4.

Package Type	θ_{JA}^1	θ_{JC}	Unit
8-Lead MSOP (RM)	210	45	°C/W
8-Lead SOIC (R)	158	43	°C/W

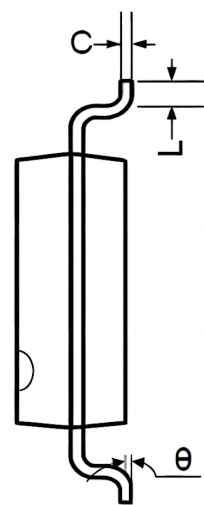
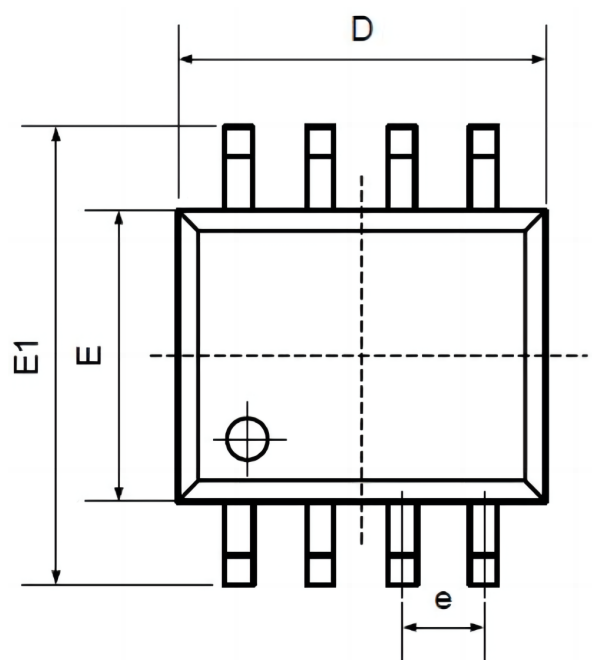
¹ θ_{JA} is specified for worst-case conditions; that is, θ_{JA} is specified for a device soldered in the circuit board for surface-mount packages.



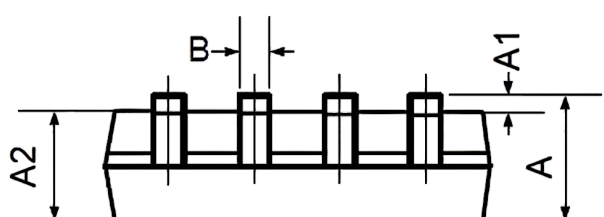
Order information

Order Number	Package	Package Quantity	Marking On The park
AD8656ARZ-REEL-TUDI	SOP8	Tape,Reel,2500	AD8656ARZ-REEL

Package SOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°





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