Low Cost, 300 MHz Voltage Feedback Amplifiers

AD8055/AD8056

FEATURES

- Low cost single (AD8055) and dual (AD8056)
- Easy-to-use voltage feedback architecture
- High speed
  - 300 MHz, −3 dB bandwidth (G = +1)
  - 1400 V/µs slew rate
  - 20 ns settling to 0.1%
  - Low distortion: −72 dBc @ 10 MHz
  - Low noise: 6 nV/√Hz
  - Low dc errors: 5 mV max V_{OS}, 1.2 µA max I_B
- Small packaging
  - AD8055 available in 5-lead SOT-23
  - AD8056 available in 8-lead MSOP
- Excellent video specifications (R_L = 150 Ω, G = +2)
  - Gain flatness 0.1 dB to 40 MHz
  - 0.01% differential gain error
  - 0.02° differential phase error
  - Drives 4 video loads (37.5 V) with 0.02% differential
  - Gain and 0.1° differential phase
- Low power, ±5 V supplies 5 mA typ/amplifier power supply current
- High output drive current: over 60 mA

APPLICATIONS

- Imaging
- Photodiode preamps
- Video line drivers
- Differential line drivers
- Professional cameras
- Video switchers
- Special effects
- A-to-D drivers
- Active filters

GENERAL DESCRIPTION

The AD8055 (single) and AD8056 (dual) voltage feedback amplifiers offer bandwidth and slew rate typically found in current feedback amplifiers. Additionally, these amplifiers are easy to use and available at a very low cost.

Despite their low cost, the AD8055 and AD8056 provide excellent overall performance. For video applications, their differential gain and phase error are 0.01% and 0.02° into a 150 Ω load and 0.02% and 0.1° while driving four video loads (37.50 Ω).

CONNECTION DIAGRAMS

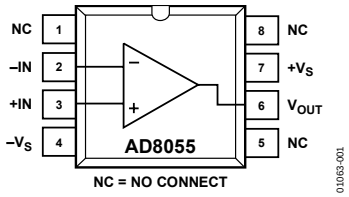


Figure 1. N-8 and R-8

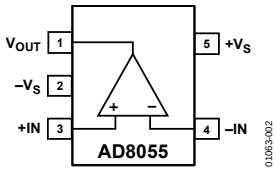


Figure 2. RJ-5

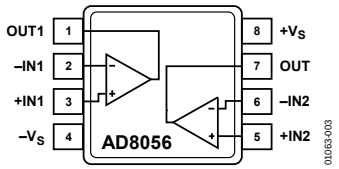


Figure 3. N-8, R-8, and RM-8

Their 0.1 dB flatness out to 40 MHz, wide bandwidth out to 300 MHz, along with 1400 V/µs slew rate and 20 ns settling time, make them useful for a variety of high speed applications.

The AD8055 and AD8056 require only 5 mA typ/amplifier of supply current and operate on a dual ±5 V or a single +12 V power supply, while capable of delivering over 60 mA of load current. The AD8055 is available in a small 8-lead PDIP, an 8-lead SOIC, and a 5-lead SOT-23, while the AD8056 is available in an 8-lead MSOP. These features make the AD8055/AD8056 ideal for portable and battery-powered applications where size and power are critical. These amplifiers in the R-8, N-8, and RM-8 packages are available in the extended temperature range of −40°C to +125°C.

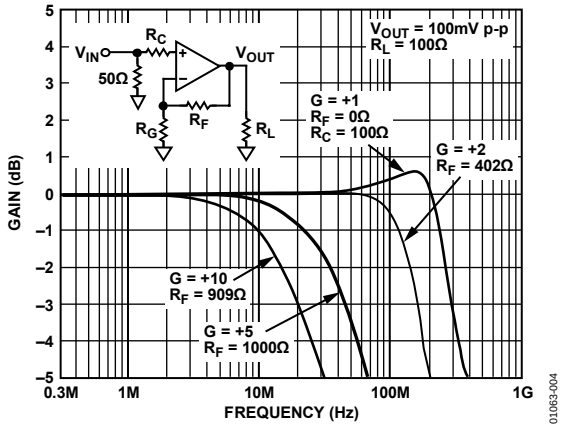


Figure 4. Frequency Response

SPECIFICATIONS

T_A = 25°C, V_S = ±5 V, R_F = 402 Ω, R_L = 100 Ω, Gain = +2, unless otherwise noted.

Table 1.

		AD8055A/AD8056A			
Parameter	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
DYNAMIC PERFORMANCE					
−3 dB Bandwidth	G = +1, V_O = 0.1 V p-p	220	300		MHz
	G=+1, V_O = 2 V p-p	125	150		MHz
	G=+2, V_O = 0.1 V p-p	120	160		MHz
	G=+2, V_O = 2 V p-p	125	150		MHz
Bandwidth for 0.1 dB Flatness	V_O = 100 mV p-p	25	40		MHz
Slew Rate	G = +1, V_O = 4 V step	1000	1400		V/µs
	G = +2, V_O = 4 V step	750	840		V/µs
Settling Time to 0.1%	G = +2, V_O = 2 V step		20		ns
Rise and Fall Time, 10% to 90%	G = +1, V_O = 0.5 V step		2		ns
	G = +1, V_O = 4 V step		2.7		ns
	G = +2, V_O = 0.5 V step		2.8		ns
	G = +2, V_O = 4 V step		4		ns
NOISE/HARMONIC PERFORMANCE					
Total Harmonic Distortion	f_C = 10 MHz, V_O = 2 V p-p, R_L = 1 kΩ		−72		dBc
	f_C = 20 MHz, V_O = 2 V p-p, R_L = 1 kΩ		−57		dBc
Crosstalk, Output-to-Output (AD8056)	f = 5 MHz, G = +2		−60		dB
Input Voltage Noise	f = 100 kHz		6		nV/√Hz
Input Current Noise	f = 100 kHz		1		pA/√Hz
Differential Gain Error	NTSC, G = +2, R_L = 150 Ω		0.01		%
	NTSC, G = +2, R_L = 37.5 Ω		0.02		%
Differential Phase Error	NTSC, G = +2, R_L = 150 Ω		0.02		Degree
	NTSC, G = +2, R_L = 37.5 Ω		0.1		Degree
DC PERFORMANCE					
Input Offset Voltage			3	5	mV
	T_{MIN} to T_{MAX}			10	mV
Offset Drift		6			µV/°C
Input Bias Current			0.4	1.2	µA
	T_{MIN} to T_{MAX}	1			µA
Open-Loop Gain	V_O = ±2.5 V	66	71		dB
	T_{MIN} to T_{MAX}	64			dB
INPUT CHARACTERISTICS					
Input Resistance			10		MΩ
Input Capacitance			2		pF
Input Common-Mode Voltage Range			3.2		±V
Common-Mode Rejection Ratio	V_{CM} = ±2.5 V		82		dB
OUTPUT CHARACTERISTICS					
Output Voltage Swing	R_L = 150 Ω	2.9	3.1		±V
Output Current[1]	V_O = ±2.0 V	55	60		mA
Short-Circuit Current[1]			110		mA

Parameter	Conditions	AD8055A/AD8056A Min	Typ	Max	Unit
POWER SUPPLY					
Operating Range		±4.0	±5.0	±6.0	V
Quiescent Current	AD8055		5.4	6.5	mA
	T_{MIN} to 125°C		7.6		mA
	T_{MIN} to 85°C			7.3	mA
	AD8056		10	12	mA
	T_{MIN} to 125°C		13.9		mA
	T_{MIN} to 85°C			13.3	mA
Power Supply Rejection Ratio	$+V_S$ = +5 V to +6 V, $-V_S$ = −5 V	66	72		dB
	$-V_S$ = −5 V to −6 V, $+V_S$ = +5 V	69	86		dB
OPERATING TEMPERATURE RANGE	AD8055ART	−40		+85	°C
	AD8055AR, AD8055AN, AD8056AR, AD8056AN, AD8056ARM	−40		+125	°C

[1] Output current is limited by the maximum power dissipation in the package. See Figure 5.

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Ratings
Supply Voltage	13.2 V
Input Voltage (Common Mode)	$\pm V_S$
Differential Input Voltage	±2.5 V
Output Short-Circuit Duration	Observe Power Derating Curves
Storage Temperature Range N, R	−65°C to +150°C
Operating Temperature Range (A Grade)	−40°C to +125°C
Lead Temperature (Soldering 10 sec)	300°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.

MAXIMUM POWER DISSIPATION

The maximum power that can be safely dissipated by the AD8055/AD8056 is limited by the associated rise in junction temperature. The maximum safe junction temperature for plastic encapsulated devices is determined by the glass transition temperature of the plastic, approximately 150°C. Exceeding this limit temporarily can cause a shift in parametric performance due to a change in the stresses exerted on the die by the package. Exceeding a junction temperature of 175°C for an extended period can result in device failure.

While the AD8055/AD8056 are internally short-circuit protected, this may not be sufficient to guarantee that the maximum junction temperature (150°C) is not exceeded under all conditions. To ensure proper operation, it is necessary to observe the maximum power derating curves.

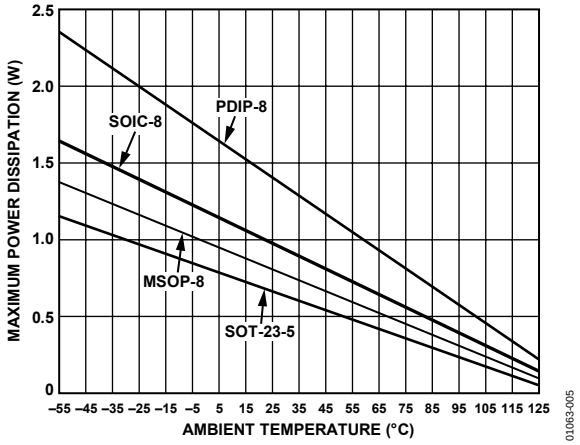
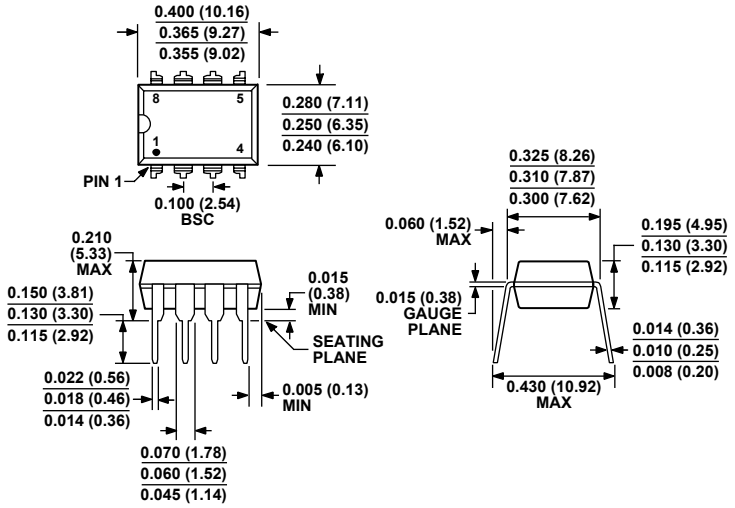


Figure 5. Plot of Maximum Power Dissipation vs. Temperature for AD8055/AD8056

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

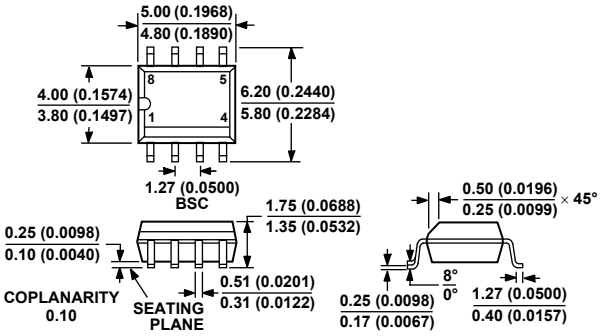
OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MS-001-BA

CONTROLLING DIMENSIONS ARE IN INCHES; MILLIMETER DIMENSIONS (IN PARENTHESES) ARE ROUNDED-OFF INCH EQUIVALENTS FOR REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN. CORNER LEADS MAY BE CONFIGURED AS WHOLE OR HALF LEADS.

Figure 42. 8-Lead Plastic Dual In-Line Package [PDIP]
Narrow Body (N-8)
Dimensions shown in inches and (millimeters)



COMPLIANT TO JEDEC STANDARDS MS-012-AA

CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 43. 8-Lead Standard Small Outline Package [SOIC_N]
Narrow Body (R-8)
Dimensions shown in millimeters and (inches)

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Branding
AD8055AN	−40°C to +125°C	8-Lead PDIP	N-8	
AD8055ANZ[1]	−40°C to +125°C	8-Lead PDIP	N-8	
AD8055AR	−40°C to +125°C	8-Lead SOIC_N	R-8	
AD8055AR-REEL	−40°C to +125°C	8-Lead SOIC_N, 13" Tape and Reel	R-8	
AD8055AR-REEL7	−40°C to +125°C	8-Lead SOIC_N, 7" Tape and Reel	R-8	
AD8055ARZ[1]	−40°C to +125°C	8-Lead SOIC_N	R-8	
AD8055ARZ-REEL[1]	−40°C to +125°C	8-Lead SOIC_N, 13" Tape and Reel	R-8	
AD8055ARZ-REEL7[1]	−40°C to +125°C	8-Lead SOIC_N, 7" Tape and Reel	R-8	
AD8055ART-R2	−40°C to +85°C	5-Lead SOT-23, Reel	RJ-5	H3A
AD8055ART-REEL	−40°C to +85°C	5-Lead SOT-23, 13" Tape and Reel	RJ-5	H3A
AD8055ART-REEL7	−40°C to +85°C	5-Lead SOT-23, 7" Tape and Reel	RJ-5	H3A
AD8055ARTZ-R2[1]	−40°C to +85°C	5-Lead SOT-23, Reel	RJ-5	H3A
AD8055ARTZ-REEL7[1]	−40°C to +85°C	5-Lead SOT-23, 7" Tape and Reel	RJ-5	H07[2]
AD8056AN	−40°C to +125°C	8-Lead PDIP	N-8	
AD8056ANZ[1]	−40°C to +125°C	8-Lead PDIP	N-8	
AD8056AR	−40°C to +125°C	8-Lead SOIC_N	R-8	
AD8056AR-REEL	−40°C to +125°C	8-Lead SOIC_N, 13" Tape and Reel	R-8	
AD8056AR-REEL7	−40°C to +125°C	8-Lead SOIC_N, 7" Tape and Reel	R-8	
AD8056ARZ[1]	−40°C to +125°C	8-Lead SOIC_N	R-8	
AD8056ARZ-REEL[1]	−40°C to +125°C	8-Lead SOIC_N, 13" Tape and Reel	R-8	
AD8056ARZ-REEL7[1]	−40°C to +125°C	8-Lead SOIC_N, 7" Tape and Reel	R-8	
AD8056ARM	−40°C to +125°C	8-Lead MSOP	RM-8	H5A
AD8056ARM-REEL	−40°C to +125°C	8-Lead MSOP, 13" Tape and Reel	RM-8	H5A
AD8056ARM-REEL7	−40°C to +125°C	8-Lead MSOP, 7" Tape and Reel	RM-8	H5A
AD8056ARMZ[1]	−40°C to +125°C	8-Lead MSOP	RM-8	H5A#
AD8056ARMZ-REEL[1]	−40°C to +125°C	8-Lead MSOP, 13" Tape and Reel	RM-8	H5A#
AD8056ARMZ-REEL7[1]	−40°C to +125°C	8-Lead MSOP, 7" Tape and Reel	RM-8	H5A#

[1] Z = Pb-free part, # denotes lead-free product may be top or bottom marked.
[2] Prior to 0542, parts were branded H3A.