ANALOG DEVICES

High Speed, Low Power Dual Op Amp

AD827

FEATURES
High Speed
 50 MHz Unity Gain Stable Operation
 300 V/ms Slew Rate
 120 ns Settling Time
 Drives Unlimited Capacitive Loads
Excellent Video Performance
 0.04% Differential Gain @ 4.4 MHz
 0.198 Differential Phase @ 4.4 MHz
Good DC Performance
 2 mV max Input Offset Voltage
 15 mV/8C Input Offset Voltage Drift
 Available in Tape and Reel in Accordance with
 EIA-481A Standard
Low Power
 Only 10 mA Total Supply Current for Both Amplifiers
 ±5 V to ±15 V Supplies

CONNECTION DIAGRAMS

8-Lead Plastic (N) and Cerdip (Q) Packages

16-Lead Small Outline (R) Package

NC = NO CONNECT

20-Lead LCC (E) Package

NC = NO CONNECT

PRODUCT DESCRIPTION
The AD827 is a dual version of Analog Devices' industry-standard AD847 op amp. Like the AD847, it provides high speed, low power performance at low cost. The AD827 achieves a 300 V/μs slew rate and 50 MHz unity-gain bandwidth while consuming only 100 mW when operating from ±5 volt power supplies. Performance is specified for operation using ±5 V to ±15 V power supplies.
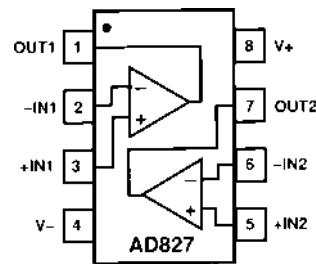
The AD827 offers an open-loop gain of 3,500 V/V into 500 Ω loads. It also features a low input voltage noise of 15 nV/$\sqrt{\text{Hz}}$, and a low input offset voltage of 2 mV maximum. Common-mode rejection ratio is a minimum of 80 dB. Power supply rejection ratio is maintained at better than 20 dB with input frequencies as high as 1 MHz, thus minimizing noise feedthrough from switching power supplies.

The AD827 is also ideal for use in demanding video applications, driving coaxial cables with less than 0.04% differential gain and 0.19° differential phase errors for 643 mV p-p into a 75 Ω reverse terminated cable.
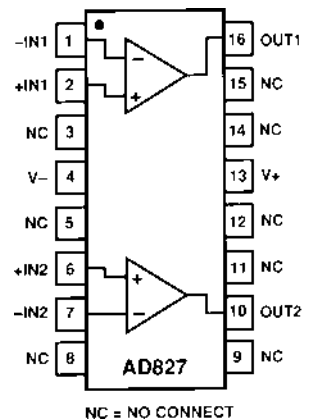
The AD827 is also useful in multichannel, high speed data conversion systems where its fast (120 ns to 0.1%) settling time is of importance. In such applications, the AD827 serves as an input buffer for 8-bit to 10-bit A/D converters and as an output amplifier for high speed D/A converters.

APPLICATION HIGHLIGHTS
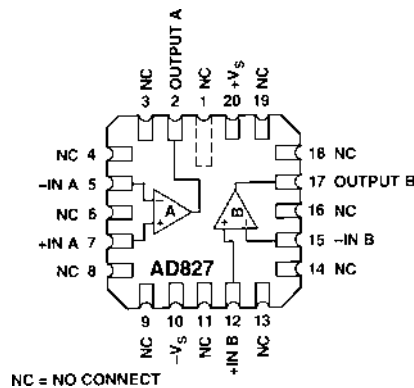1. Performance is fully specified for operation using ±5 V to ±15 V supplies.

2. A 0.04% differential gain and 0.19° differential phase error at the 4.4 MHz color subcarrier frequency, together with its low cost, make it ideal for many video applications.

3. The AD827 can drive unlimited capacitive loads, while its 30 mA output current allows 50 Ω and 75 Ω reverse-terminated loads to be driven.

4. The AD827's 50 MHz unity-gain bandwidth makes it an ideal candidate for multistage active filters.

5. The AD827 is available in 8-lead plastic mini-DIP and cerdip, 20-lead LCC, and 16-lead SOIC packages. Chips and MIL-STD-883B processing are also available.

© Analog Devices, Inc., 2002

AD827–SPECIFICATIONS

AD827–SPECIFICATIONS (@ T_A = +25°C, unless otherwise noted.)

Model	Conditions	V_S	AD827J Min	Typ	Max	AD827A/S Min	Typ	Max	Unit
DC PERFORMANCE									
Input Offset Voltage[1]		±5 V		0.5	2		0.3	2	mV
	T_{MIN} to T_{MAX}				3.5			4	mV
		±15 V			4			4	mV
	T_{MIN} to T_{MAX}				6			6	mV
Offset Voltage Drift		±5 V to ±15 V		15			15		µV/°C
Input Bias Current		±5 V to ±15 V		3.3	7		3.3	7	µA
	T_{MIN} to T_{MAX}				8.2			9.5	µA
Input Offset Current		±5 V to ±15 V		50	300		50	300	nA
	T_{MIN} to T_{MAX}				400			400	nA
Offset Current Drift		±5 V to ±15 V		0.5			0.5		nA/°C
Common-Mode Rejection Ratio	V_{CM} = ±2.5 V	±5 V	78	95		80	95		dB
	V_{CM} = ±12 V	±15 V	78	95		80	95		dB
	T_{MIN} to T_{MAX}	±5 V to ±15 V	75			75			dB
Power Supply Rejection Ratio		±5 V to ±15 V	75	86		75	86		dB
	T_{MIN} to T_{MAX}		72			72			dB
Open-Loop Gain									
	V_O = ±2.5 V	±5 V							
	R_{LOAD} = 500 Ω		2	3.5		2	3.5		V/mV
	T_{MIN} to T_{MAX}		1			1			V/mV
	R_{LOAD} = 150 Ω			1.6			1.6		V/mV
	V_{OUT} = ±10 V	±15 V							
	R_{LOAD} = 1 kΩ		3	5.5		3	5.5		V/mV
	T_{MIN} to T_{MAX}		1.5			1.5			V/mV
MATCHING CHARACTERISTICS									
Input Offset Voltage		±5 V		0.4			0.2		mV
Crosstalk	f = 5 MHz	±5 V		85			85		dB
DYNAMIC PERFORMANCE									
Unity-Gain Bandwidth		±5 V		35			35		MHz
		±15 V		50			50		MHz
Full Power Bandwidth[2]	V_O = 5 V p-p, R_{LOAD} = 500 Ω	±5 V		12.7			12.7		MHz
	V_O = 20 V p-p, R_{LOAD} = 1 kΩ	±15 V		4.7			4.7		MHz
Slew Rate[3]	R_{LOAD} = 500 Ω	±5 V		200			200		V/µs
	R_{LOAD} = 1 kΩ	±15 V		300			300		V/µs
Settling Time to 0.1%	A_V = −1								
	−2.5 V to +2.5 V	±5 V		65			65		ns
	−5 V to +5 V	±15 V		120			120		ns
Phase Margin	C_{LOAD} = 10 pF	±15 V							
	R_{LOAD} = 1 kΩ			50			50		Degrees
Differential Gain Error	f = 4.4 MHz	±15 V		0.04			0.04		%
Differential Phase Error	f = 4.4 MHz	±15 V		0.19			0.19		Degrees
Input Voltage Noise	f = 10 kHz	±15 V		15			15		nV/$\sqrt{Hz}$
Input Current Noise	f = 10 kHz	±15 V		1.5			1.5		pA/$\sqrt{Hz}$
Input Common-Mode Voltage Range		±5 V		+4.3			+4.3		V
				−3.4			−3.4		V
		±15 V		+14.3			+14.3		V
				−13.4			−13.4		V
Output Voltage Swing	R_{LOAD} = 500 Ω	±5 V	3.0	3.6		3.0	3.6		±V
	R_{LOAD} = 150 Ω	±5 V	2.5	3.0		2.5	3.0		±V
	R_{LOAD} = 1 kΩ	±15 V	12	13.3		12	13.3		±V
	R_{LOAD} = 500 Ω	±15 V	10	12.2		10	12.2		±V
Short-Circuit Current Limit		±5 V to ±15 V		32			32		mA
INPUT CHARACTERISTICS									
Input Resistance				300			300		kΩ
Input Capacitance				1.5			1.5		pF

Model	Conditions	V_S	AD827J			AD827A/S			Unit
			Min	Typ	Max	Min	Typ	Max	
OUTPUT RESISTANCE	Open Loop			15				15	Ω
POWER SUPPLY									
Operating Range			±4.5		±18	±4.5		±18	V
Quiescent Current		±5 V		10	13		10	13	mA
	T_{MIN} to T_{MAX}				16			16.5/17.5	mA
		±15 V		10.5	13.5		10.5	13.5	mA
	T_{MIN} to T_{MAX}				16.5			17/18	mA
TRANSISTOR COUNT				92			92		

NOTES
[1] Offset voltage for the AD827 is guaranteed after power is applied and the device is fully warmed up. All other specifications are measured using high speed test equipment, approximately 1 second after power is applied.
[2] Full Power Bandwidth = Slew Rate/2 π V_{PEAK}.
[3] Gain = +1, rising edge.
All min and max specifications are guaranteed.

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS[1]
Supply Voltage . . . . ±18 V
Internal Power Dissipation[2]
   Plastic (N) Package (Derate at 10 mW/°C) . . . . 1.5 W
   Cerdip (Q) Package (Derate at 8.7 mW/°C) . . . . 1.3 W
   Small Outline (R) Package (Derate at 10 mW/°C) . . . 1.5 W
   LCC (E) Package (Derate at 6.7 mW/°C) . . . . 1.0 W
Input Common-Mode Voltage . . . . ±V_S
Differential Input Voltage . . . . 6 V
Output Short Circuit Duration[3] . . . . Indefinite
Storage Temperature Range (N, R) . . . . –65°C to +125°C
Storage Temperature Range (Q) . . . . –65°C to +150°C
Operating Temperature Range
   AD827J . . . . 0°C to 70°C
   AD827A . . . . –40°C to +85°C
   AD827S . . . . –55°C to +125°C
Lead Temperature Range
   (Soldering to 60 sec) . . . . 300°C

NOTES
[1] Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only, and 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 ratings for extended periods may affect device reliability.
[2] Maximum internal power dissipation is specified so that T_J does not exceed 175°C at an ambient temperature of 25°C.
   Thermal Characteristics:
   MiniDIP: θ_{JA} = 100°C/W; θ_{JC} = 33°C/W
   Cerdip: θ_{JA} = 110°C/W; θ_{JC} = 30°C/W
   16-Lead Small Outline Package: θ_{JA} = 100°C/W
   20-Lead LCC: θ_{JA} = 150°C/W; θ_{JC} = 35°C/W
[3] Indefinite short circuit duration is only permissible as long as the absolute maximum power rating is not exceeded.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
AD827JN	0°C to +70°C	8-Lead Plastic DIP	N-8
AD827JR	0°C to +70°C	16-Lead Plastic SO	R-16
AD827AQ	–40°C to +85°C	8-Lead Cerdip	Q-8
AD827SQ	–55°C to +125°C	8-Lead Cerdip	Q-8
AD827SQ/883B	–55°C to +125°C	8-Lead Cerdip	Q-8
5962-9211701MPA	–55°C to +125°C	8-Lead Cerdip	Q-8
AD827SE/883B	–55°C to +125°C	20-Lead LCC	E-20A
5962-9211701M2A	–55°C to +125°C	20-Lead LCC	E-20A
AD827JR-REEL	0°C to +70°C	Tape & Reel	
AD827JChips	0°C to +70°C	Die	
AD827SChips	–55°C to +125°C	Die	

METALLIZATION PHOTOGRAPH
Contact factory for latest dimensions.
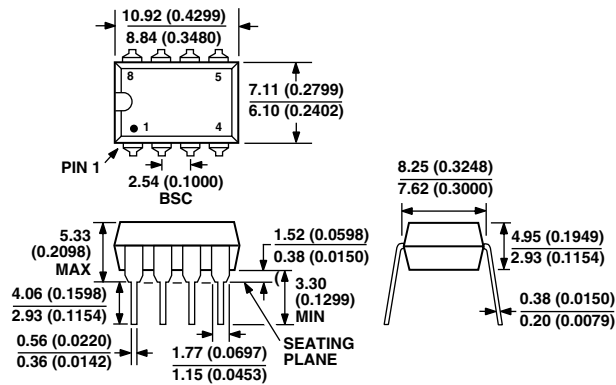Dimensions shown in inches and (mm).
Substrate is connected to V+.
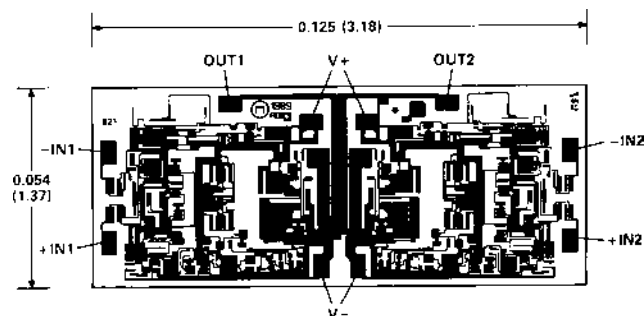
OUTLINE DIMENSIONS

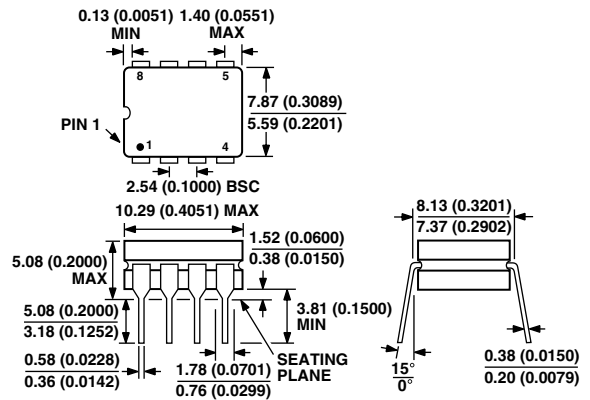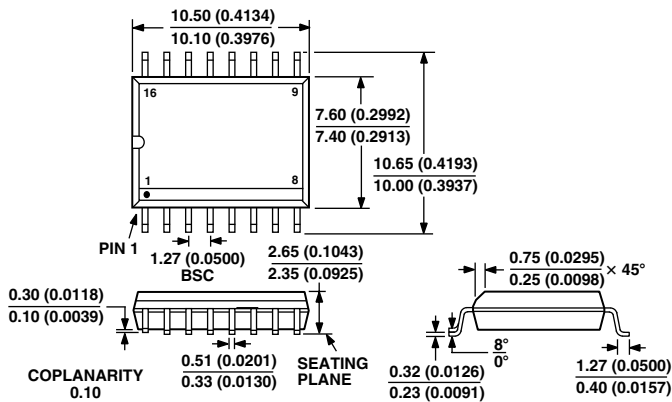### 8-Lead Plastic Dual-in-Line Package [PDIP]
(N-8)
Dimensions shown in millimeters and (inches)

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

8-Lead Ceramic DIP-Glass Hermetic Seal Package [CERDIP]
(Q-8)
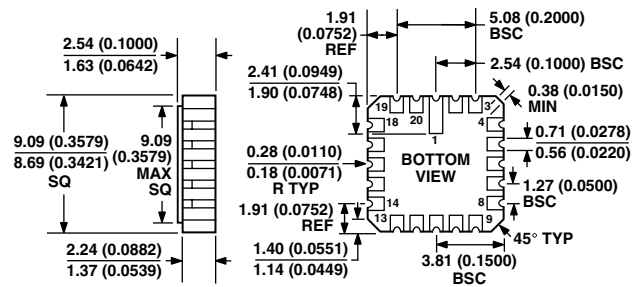Dimensions shown in millimeters and (inches)

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

16-Lead Standard Small Outline Package [SOIC]
Wide Body
(R-16)
Dimensions shown in millimeters and (inches)

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

COMPLIANT TO JEDEC STANDARDS MS-013AA

20-Terminal Ceramic Leadless Chip Carrier [LCC]
(E-20A)
Dimensions shown in millimeters and (inches)

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