

**AD845**
**FEATURES**

Replaces Hybrid Amplifiers in Many Applications

**AC PERFORMANCE:**

Settles to 0.01% in 350 ns

100 V/ $\mu$ s Slew Rate

12.8 MHz min Unity-Gain Bandwidth

1.75 MHz Full-Power Bandwidth at 20 V p-p

**DC PERFORMANCE:**

0.25 mV max Input Offset Voltage

5  $\mu$ V/ $^{\circ}$ C max Offset Voltage Drift

0.5 nA Input Bias Current

250 V/mV min Open-Loop Gain

4  $\mu$ V p-p max Voltage Noise, 0.1 Hz to 10 Hz

94 dB min CMRR

Available in Plastic Mini-DIP, Hermetic Cerdip and SOIC Packages. Also Available in Tape and Reel in Accordance with EIA-481A Standard

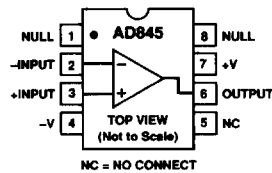
**PRODUCT DESCRIPTION**

The AD845 is a fast, precise, N channel JFET input, monolithic operational amplifier. It is fabricated using Analog Devices' complementary bipolar (CB) process. Advanced laser-wafer trimming technology enables the very low input offset voltage and offset voltage drift performance to be realized. This precision, when coupled with a slew rate of 100 V/ $\mu$ s, a stable unity-gain bandwidth of 16 MHz, and a settling time of 350 ns 0.01%—while driving a parallel load of 100 pF and 500  $\Omega$ —represents a combination of features unmatched by any FET input IC amplifier. The AD845 can easily be used to upgrade many existing designs which use BiFET or FET input hybrid amplifiers and, in some cases, those which use bipolar input op amps.

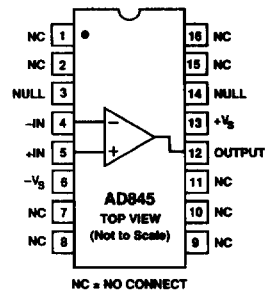
The AD845 is ideal for use in applications such as active filters, high speed integrators, photo diode preamps, sample-and-hold amplifiers, log amplifiers, and in buffering A/D and D/A converters. The 250  $\mu$ V max input offset voltage makes offset nulling unnecessary in many applications. The common-mode rejection ratio of 110 dB over a  $\pm 10$  V input voltage range represents exceptional performance for a JFET input high speed op amp. This, together with a minimum open-loop gain of 250 V/mV ensures that 12-bit performance is achieved, even in unity-gain buffer circuits.

**CONNECTION DIAGRAMS**

Plastic Mini-DIP (N) Package  
and Cerdip (Q) Package



16-Pin SOIC  
(R-16) Package



The AD845 conforms to the standard op amp pinout except that offset nulling is to  $V+$ . The AD845J and AD845K grade devices are available specified to operate over the commercial 0 to  $+70^{\circ}$ C temperature range. AD845A and AD845B devices are specified for operation over the  $-40^{\circ}$ C to  $+85^{\circ}$ C industrial temperature range. The AD845S is specified to operate over the full military temperature range of  $-55^{\circ}$ C to  $+125^{\circ}$ C. Both the industrial and military versions are available in 8-pin cerdip packages. The commercial version is available in an 8-pin plastic mini-DIP and 16-pin SOIC; "J" and "S" grade chips are also available.

**PRODUCT HIGHLIGHTS**

1. The high slew rate, fast settling time, and dc precision of the AD845 make it ideal for high speed applications requiring 12-bit accuracy.
2. The performance of circuits using the LF400, HA2520/2/5, HA2620/2/5, 3550, OPA605, and LH0062 can be upgraded in most cases.
3. The AD845 is unity-gain stable and internally compensated.
4. The AD845 is specified while driving 100 pF/500  $\Omega$  loads.

# SPECIFICATIONS (@ +25°C and ±15 V dc, unless otherwise noted)

**AD845**

Model	Conditions	AD845J/A			AD845K/B			AD845S			Units	
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
INPUT OFFSET VOLTAGE <sup>1</sup>	Initial Offset		0.7	1.5		0.1	0.25		0.25	1.0	mV	
	Offset Drift	$T_{min}-T_{max}$		2.5 20		1.5	0.4 5.0			2.0 10	mV μV/°C	
INPUT BIAS CURRENT <sup>2</sup>	Initial	$V_{CM} = 0\text{ V}$	0.75	2		0.5	1		0.75	2	nA	
		$T_{min}-T_{max}$		45/75			18/38			500	nA	
INPUT OFFSET CURRENT	Initial	$V_{CM} = 0\text{ V}$	25	300		15	100		25	300	pA	
		$T_{min}-T_{max}$		3/6.5			1.2/2.6			20	nA	
INPUT CHARACTERISTICS	Input Resistance		10 <sup>11</sup>			10 <sup>11</sup>			10 <sup>11</sup>		kΩ	
	Input Capacitance		4.0			4.0			4.0		pF	
INPUT VOLTAGE RANGE	Differential		±20			±20			±20		V	
	Common Mode		±10	+10.5/-13		±10	+10.5/-13		±10	+10.5/-13	V	
	Common-Mode Rejection	$V_{CM} = ±10\text{ V}$	<b>86</b>	110		<b>94</b>	113		<b>86</b>	110	dB	
INPUT VOLTAGE NOISE	0.1 to 10 Hz		4			4			4		μV p-p	
	f = 10 Hz		80			80			80		nV/√Hz	
	f = 100 Hz		60			60			60		nV/√Hz	
	f = 1 kHz		25			25			25		nV/√Hz	
	f = 10 kHz		18			18			18		nV/√Hz	
	f = 100 kHz		12			12			12		nV/√Hz	
INPUT CURRENT NOISE	f = 1 kHz		0.1			0.1			0.1		pA/√Hz	
OPEN-LOOP GAIN	$V_O = ±10\text{ V}$		200	500		250	500		200	500	V/mV	
	$R_{LOAD} ≥ 2\text{ kΩ}$		<b>100</b>	250		<b>125</b>	250		<b>100</b>	250	V/mV	
	$R_{LOAD} ≥ 500\text{ Ω}$		70			75			<b>50</b>		V/mV	
	$T_{min}-T_{max}$											
OUTPUT CHARACTERISTICS	Voltage	$R_{LOAD} ≥ 500\text{ Ω}$	±12.5			±12.5			±12.5			V
	Current	Short Circuit	50			50			50			mA
	Output Resistance	Open Loop	5			5			5			Ω
FREQUENCY RESPONSE	Small Signal	Unity Gain	12.8	16		13.6	16		13.6	16	MHz	
	Full Power Bandwidth <sup>3</sup>	$V_O = ±10\text{ V}$										
		$R_{LOAD} = 500\text{ Ω}$		1.75			1.75			1.75	MHz	
	Rise Time			20			20			20	ns	
	Overshoot			20			20			20	%	
	Slew Rate		<b>80</b>	100		<b>94</b>	100		<b>94</b>	100	V/μs	
	Settling Time	10 V Step										
	$C_{LOAD} = 100\text{ pF}$											
	$R_{LOAD} = 500\text{ Ω}$		350			350	500		350	500	ns	
	to 0.01%										ns	
	to 0.1%		250			250			250		ns	
DIFFERENTIAL GAIN	f = 4.4 MHz		0.04			0.04			0.04		%	
DIFFERENTIAL PHASE	f = 4.4 MHz		0.02			0.02			0.02		Degree	
POWER SUPPLY	Rated Performance		±15			±15			±15			V
	Operating Range		±4.75		±18	±4.75		±18	±4.75		±18	V
	Rejection Ratio	$V_S = ±5\text{ to }±15\text{ V}$	<b>88</b>	110		<b>95</b>	113		<b>88</b>	110		dB
	Quiescent Current	$T_{min}\text{ to }T_{max}$		10	12		10	12		10	12	mA

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**NOTES**
<sup>1</sup>Input offset voltage specifications are guaranteed after 5 minutes of operation at  $T_A = +25^\circ\text{C}$ .

<sup>2</sup>Bias current specifications are guaranteed maximum at either input after 5 minutes of operation at  $T_A = +25^\circ\text{C}$ .

<sup>3</sup>FPBW = slew rate/2π V peak.

<sup>4</sup>"S" grade  $T_{min}-T_{max}$  are tested with automatic test equipment at  $T_A = -55^\circ\text{C}$  and  $T_A = +125^\circ\text{C}$ .

All min and max specifications are guaranteed. Specifications shown in **boldface** are tested on all production units at final electrical test. Results from these tests are used to calculate outgoing quality levels.

Specifications subject to change without notice.

# AD845

## ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

Supply Voltage	±18 V
Internal Power Dissipation <sup>2</sup>	
Plastic Mini-DIP	1.6 Watts
Cerdip	1.4 Watts
16-Pin SOIC	1.5 Watts
Input Voltage	±V <sub>S</sub>
Output Short-Circuit Duration	Indefinite
Differential Input Voltage	+V <sub>S</sub> and -V <sub>S</sub>
Storage Temperature Range	
Q	-65°C to +150°C
N, R	-65°C to +125°C
Lead Temperature Range (Soldering 60 sec)	+300°C

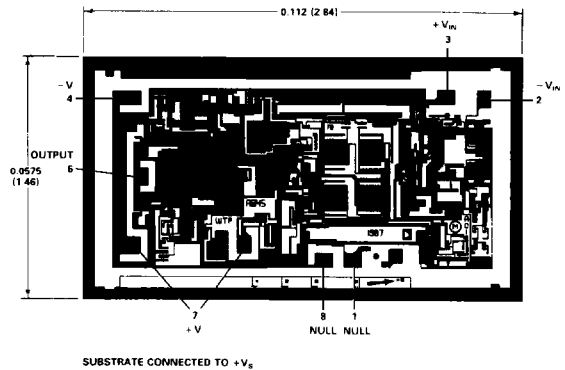
## NOTES

<sup>1</sup>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 sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

<sup>2</sup>Mini-DIP package:  $\theta_{JA} = 100^\circ\text{C}/\text{W}$ ; cerdip package:  $\theta_{JA} = 110^\circ\text{C}/\text{W}$ ; SOIC package:  $\theta_{JA} = 100^\circ\text{C}/\text{W}$ .

## METALIZATION PHOTOGRAPH

Dimensions shown in inches and (mm).  
Contact factory for latest dimensions.



## ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option*
AD845JN	0°C to +70°C	8-Pin Plastic Mini-DIP	N-8
AD845KN	0°C to +70°C	8-Pin Plastic Mini-DIP	N-8
AD845JR	0°C to +70°C	16-Pin SOIC	R-16
AD845AQ	-40°C to +85°C	8-Pin Cerdip	Q-8
AD845BQ	-40°C to +85°C	8-Pin Cerdip	Q-8
AD845SQ	-55°C to +125°C	8-Pin Cerdip	Q-8
AD845SQ/883B	-55°C to +125°C	8-Pin Cerdip	Q-8
5962-8964501PA	-55°C to +125°C	8-Pin Cerdip	Q-8
AD845J Chips	0°C to +70°C	Die	
AD845S Chips	-55°C to +125°C	Die	
AD845JR-Reel	0°C to +70°C	Tape & Reel	

\*N = Plastic DIP; Q = Cerdip; R = Small Outline IC (SOIC). For outline information see Package Information section.