Single Supply, Rail-to-Rail Low Power, FET-Input Op Amp

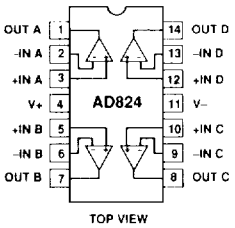
AD824

FEATURES
Single-Supply Operation: 3 to 30 Volts
Very Low Input Bias Current: 2 pA
Wide Input Voltage Range
Rail-to-Rail Output Swing
Low Supply Current: 500 μA/Amp
Wide Bandwidth: 2 MHz
Slew Rate: 2 V/μs
No Phase Reversal

APPLICATIONS
Photo Diode Preamplifier
Battery Powered Instrumentation
Power Supply Control and Protection
Medical Instrumentation
Remote Sensors
Low Voltage Strain Gage Amplifiers
DAC Output Amplifier

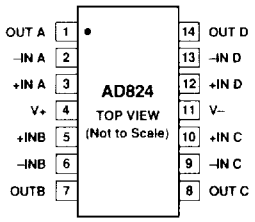
PIN CONFIGURATIONS

14-Lead Epoxy DIP (N Suffix)



TOP VIEW

14-Lead Epoxy SO (R Suffix)



GENERAL DESCRIPTION

The AD824 is a quad, FET input single-supply amplifier featuring rail-to-rail outputs. The combination of FET inputs and rail-to-rail outputs makes the AD824 useful in a wide variety of low voltage applications where low input current is a primary consideration.

The AD824 is guaranteed to operate from a 3 V single supply up to ±15 volt dual supplies.

Fabricated on ADI's complementary bipolar process, the AD824 has a unique input stage that allows the input voltage to safely extend beyond the negative supply and to the positive supply without any phase inversion or latchup. The output voltage swings to within 15 millivolts of the supplies. Capacitive loads to 350 pF can be handled without oscillation.

The FET input combined with laser trimming provides an input that has extremely low bias currents with guaranteed offsets below 300 μV. This enables high accuracy designs even with high source impedances. Precision is combined with low noise making the AD824 ideal for use in battery powered medical equipment.

Applications for the AD824 include portable medical equipment, photo diode preamplifiers, and high impedance transducer amplifiers.

The ability of the output to swing rail-to-rail enables designers to build multistage filters in single supply systems and maintain high signal-to-noise ratios.

The AD824 is specified over the extended industrial (−40°C to +85°C) temperature range and is available in 14-pin DIPs and narrow 14-pin SO packages.

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ORDERING GUIDE

Model	Temperature Range	Package Option*
AD824AN	−40°C to +85°C	14-Pin Plastic DIP
AD824BN	−40°C to +85°C	14-Pin Plastic DIP
AD824AR-14	−40°C to +85°C	14-Pin SOIC
AD824AR-14-REEL	−40°C to +85°C	14-Pin SOIC
AD824AR-14-3V	−40°C to +85°C	14-Pin SOIC
AD824AR-14-3V-REEL	−40°C to +85°C	14-Pin SOIC
AD824AR-16	−40°C to +85°C	16-Pin SOIC
AD824AR-16-REEL	−40°C to +85°C	16-Pin SOIC
AD824ACHIPS	+25°C	DICE

*For outline information see Package Information section.

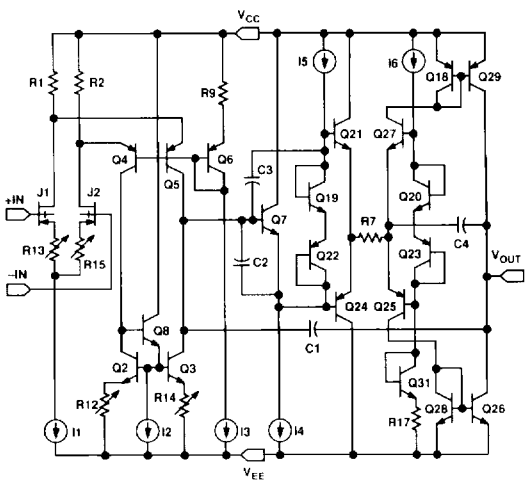

Figure 1. Simplified Schematic of 1/4 AD824

AD824–SPECIFICATIONS

ELECTRICAL SPECIFICATIONS (@ V_S = +5.0 V, V_{CM} = 0 V, V_{OUT} = 0.2 V, T_A = +25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage AD824A	V_{OS}			0.1	1.0	mV
		T_{MIN} to T_{MAX}			1.5	mV
Offset Voltage AD824B	V_{OS}				300	µV
		T_{MIN} to T_{MAX}			900	µV
Input Bias Current	I_B			2	12	pA
		T_{MIN} to T_{MAX}		300	4000	pA
Input Offset Current	I_{OS}			2	10	pA
		T_{MIN} to T_{MAX}		300		pA
Input Voltage Range			0.2		3.0	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = 0 V to 2 V	66	80		dB
		V_{CM} = 0 V to 3 V	60	74		dB
		T_{MIN} to T_{MAX}	60			dB
Input Impedance				$10^{13}\|3.3$		Ω|pF
Large Signal Voltage Gain	A_{VO}	V_O = 0.2 V to 4.0 V				
		R_L = 2 kΩ	20	40		V/mV
		R_L = 10 kΩ	50	100		V/mV
		R_L = 100 kΩ	250	1000		V/mV
		T_{MIN} to T_{MAX}, R_L = 100 kΩ	180	400		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			2		µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_{SOURCE} = 20 µA	4.975	4.988		V
		T_{MIN} to T_{MAX}	4.97	4.985		V
		I_{SOURCE} = 2.5 mA	4.80	4.85		V
		T_{MIN} to T_{MAX}	4.75	4.82		V
Output Voltage Low	V_{OL}	I_{SINK} = 20 µA		15	25	mV
		T_{MIN} to T_{MAX}		20	30	mV
		I_{SINK} = 2.5 mA		120	150	mV
		T_{MIN} to T_{MAX}		140	200	mV
Short Circuit Limit	I_{SC}	Sink/Source		±12		mA
		T_{MIN} to T_{MAX}		±10		mA
Open-Loop Impedance	Z_{OUT}	f = 1 MHz, A_V = 1		100		Ω
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = 2.7 V to 12 V	70	80		dB
		T_{MIN} to T_{MAX}	66			dB
Supply Current/Amplifier	I_{SY}	T_{MIN} to T_{MAX}		500	600	µA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L = 10 kΩ, A_V = 1		2		V/µs
Full-Power Bandwidth	BW_P	1% Distortion, V_O = 4 V p-p		150		kHz
Settling Time	t_S	V_{OUT} = 0.2 V to 4.5 V, to 0.01%		2.5		µs
Gain Bandwidth Product	GBP			2		MHz
Phase Margin	φo	No Load		50		Degrees
Channel Separation	CS	f = 1 kHz, R_L = 2 kΩ		123		dB
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		2		µV p-p
Voltage Noise Density	e_n	f = 1 kHz		16		nV/√Hz
Current Noise Density	i_{IN}	f = 1 kHz		0.8		fA/√Hz
Total Harmonic Distortion	THD	f = 10 kHz, R_L = 0, A_V = +1		0.005		%

NOTE: For +3 V and ±15 V specifications, request complete data sheet.

Specifications subject to change without notice.