



Parameter	Conditions	AS324N			Units
		Min	Typ	Max	
Short Circuit to Ground	$V^+ = 15 V_{DC}, T_A = 25^\circ C$		40	60	$mA_{DC}$
Input Offset Voltage				$\pm 9$	$mV_{DC}$
Input Offset Voltage Drift	$R_S = 0 \Omega$		$\pm 7$		$\mu V/^\circ C$
Input Bias Current	$I_{IN(+)} - I_{IN(-)}, V_{CM} = 0 V$			$\pm 150$	$nA_{DC}$
Input Offset Current Drift	$R_S = 0 \Omega$		$\pm 10$		$pA_{DC}/^\circ C$
Input Bias Current	$I_{IN(+)} \text{ or } I_{IN(-)}$		40	500	$nA_{DC}$
Input Common-Mode Voltage Range	$V^+ = +30 V_{DC}$	0		$V^+ - 2$	$V_{DC}$
Large Signal Voltage Gain	$V^+ = +15 V_{DC}$ ( $V_O \text{ Swing} = 1 V_{DC} \text{ to } 11 V_{DC}$ ) $R_L \geq 2 k\Omega$	15			$V/mV$
Output Voltage Swing	$V_{OH}$	$V^+ = +30 V_{DC}, R_L = 2 k\Omega$	26		$V_{DC}$
		$R_L \geq 10 k\Omega$	27	28	
	$V_{OL}$	$V^+ = 5 V_{DC}, R_L \geq 10 k\Omega$	5	20	$mV_{DC}$
Output Current	Source	$V_O = 2 V_{DC}$ $V_{IN}^+ = +1 V_{DC},$ $V_{IN}^- = 0 V_{DC}, V^+ = 15 V_{DC}$	10	20	$mA_{DC}$
	Sink	$V_{IN}^+ = +1 V_{DC},$ $V_{IN}^- = 0 V_{DC}, V^+ = 15 V_{DC}$	5	8	

• AS324N are manufactured in packages 14 DIP plastic with 2,5 mm-pin spacing (2,54 mm by equivalent).



## Low Power Quad Operational Amplifier

### General Description

The AS324N series consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits which now can be more easily implemented in single power supply systems. For example, the AS324N series can be directly operated off of the standard +5  $V_{DC}$  power supply voltage which is used in digital systems and will easily provide the required interface electronics without requiring the additional  $\pm 15 V_{DC}$  power supply.

### Unique Characteristics

- In the linear mode the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from only a single power supply voltage.
- The unity gain cross frequency is temperature compensated.
- The input bias current is also temperature compensated.

### Advantages

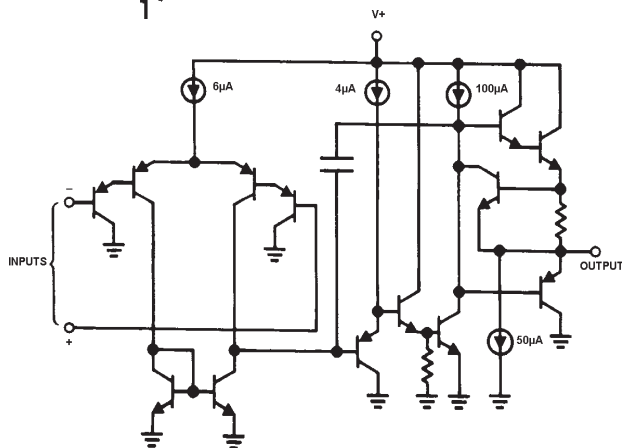
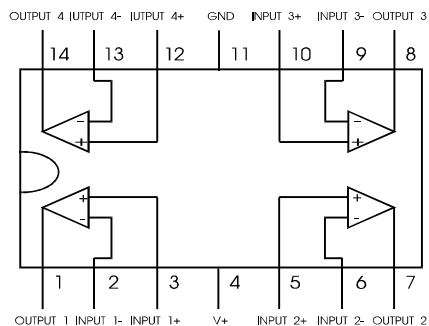
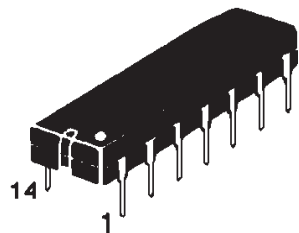
- Eliminated need for dual supplies.
- Four internally compensated op amps in a single package.
- Allows directly sensing near GND and  $V_{OUT}$  also goes to GND.
- Compatible with all forms of logic.
- Power drain suitable for battery operation.

### Features

- Internally frequency compensated for unity gain.
- Large DC voltage gain 100 dB
- Wide bandwidth (unity gain) 1 MHz
- Wide power supply range:
  - Single supply  $3 V_{DC} \text{ to } 32 V_{DC}$
  - or dual supplies  $\pm 1,5 V_{DC} \text{ to } \pm 16 V_{DC}$
- Very low supply current drain (700  $\mu A$ ) - essentially independent of supply voltage.
- Low input biasing current 45  $nA_{DC}$  (temperature compensated)
- Low input offset voltage 2  $mV_{DC}$  and offset current 5  $nA_{DC}$
- Input common-mode voltage range includes ground.
- Differential input voltage equal to the power supply voltage.
- Large output voltage swing  $0 V_{DC} \text{ to } V^+ - 1,5 V_{DC}$



Connection Diagram  
Dual-in-Line Package



Schematic Diagram  
(Each Amplifier)

Absolute Maximum Ratings

Supply Voltage, $V^+$	$32 V_{DC}$ or $\pm 16 V_{DC}$
Differential Input Voltage	$32 V_{DC}$
Input Voltage	$-0,3 V_{DC}$ to $+32 V_{DC}$
Input Current ( $V_{IN} < -0,3 V_{DC}$ )	50 mA
Power Dissipation	1130 mW
Output Short-Circuit to GND (One Amplifier) $V^+ \leq 15 V_{DC}$ and $T_A = 25^\circ C$	Continuous
Operating Temperature Range	$0^\circ C$ to $70^\circ C$
Storage Temperature Range	$-65^\circ C$ to $+150^\circ C$
Lead Temperature (Soldering, 10 seconds)	$260^\circ C$



Electrical Characteristics  $V^+ = +5,0 V_{DC}$ , unless otherwise stated

Parameter	Conditions	AS324N			Units
		Min	Typ	Max	
Input Offset Voltage	$T_A = 25^\circ C$		$\pm 2$	$\pm 7$	$mV_{DC}$
Input Bias Current	$I_{IN(+)}$ or $I_{IN(-)}$ , $V_{CM} = 0 V$ , $T_A = 25^\circ C$		45	250	$nA_{DC}$
Input Offset Current	$I_{IN(+)} - I_{IN(-)}$ , $V_{CM} = 0 V$ , $T_A = 25^\circ C$		$\pm 5$	$\pm 50$	$nA_{DC}$
Input Common-Mode Voltage Range	$V^+ = 30 V_{DC}$ , $T_A = 25^\circ C$	0		$V^+ - 1.5$	$V_{DC}$
Supply Current	Over Full Temperature Range $R_L = \text{On All Op Amps}$ $V^+ = 30 V$ $V^+ = 5 V$		1.5 0.7	3 1.2	$mA_{DC}$
Large Signal Voltage Gain	$V^+ = 15 V_{DC}$ , $R_L \geq 2 k\Omega$ ( $V_0 = 1 V_{DC}$ to $11 V_{DC}$ ), $T_A = 25^\circ C$	25	100		V/mV
Common-Mode Rejection Ratio	DC, $V_{CM} = 0 V$ to $V^+ - 1.5 V_{DC}$ $T_A = 25^\circ C$	65	85		dB
Power Supply Rejection Ratio	DC, $V^+ = 5 V_{DC}$ to $30 V_{DC}$ $T_A = 25^\circ C$	65	100		dB
Amplifier-to-Amplifier Coupling	$f = 1 kHz$ to $20 kHz$ , $T_A = 25^\circ C$ (Input Referred)			-120	
Output Current	Source $V_{IN}^+ = 1 V_{DC}$ , $V_{IN}^- = 0 V_{DC}$ , $V^+ = 15 V_{DC}$ , $V_0 = 2 V_{DC}$ , $T_A = 25^\circ C$	20	40		$mA_{DC}$
	Sink $V_{IN}^- = 1 V_{DC}$ , $V_{IN}^+ = 0 V_{DC}$ , $V^+ = 15 V_{DC}$ , $V_0 = 2 V_{DC}$ , $T_A = 25^\circ C$	10	20		
		$V_{IN}^+ = 1 V_{DC}$ , $V_{IN}^- = 0 V_{DC}$ , $T_A = 25^\circ C$ , $V^+ = 15 V_{DC}$ , $V_0 = 200 mV_{DC}$	12	50	