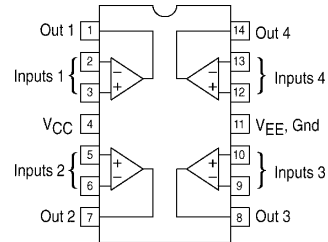
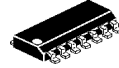
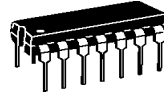


## FEATURES

- Short circuit protected outputs
- 3 to 32 V Supply
- Low input bias current
- True differential input stage
- Four devices in a single package
- Industry standard pin layout
- Internally compensated

## PIN ARRANGEMENT

**14 DIP LM324**
**14 SOP LM324S**


## ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Power Supply Voltage	$V_{CC}$	+32 or $\pm 16$	V
Input Differential Voltage Range	$V_{IDR}$	$\pm 32$	V
Input Common Mode Voltage Range	$V_{ICR}$	-0.3 to +32	V
Output Short Circuit-to-Ground	$I_{SC}$	Continuous	mA
Operating Ambient Temperature Range	$T_A$	0 to 70	$^{\circ}C$
Operating Junction Temperature	$T_J$	150	$^{\circ}C$
Storage Temperature Range	$T_S$	-65 to 150	$^{\circ}C$

## ELECTRICAL CHARACTERISTICS

$V_{CC} = 5.0V$ ,  $V_{EE} = GND$ ,  $T_A = 25^{\circ}C$  (unless otherwise noted)

Item	Symbol	Min	Typ	Max	Unit
Input Offset Voltage $0^{\circ}C \leq T_A \leq 70^{\circ}C$	$V_{IO}$	---	2.0	7.0	mV
Avg. Temp. Coeff. of Input Offset Voltage $0^{\circ}C \leq T_A \leq 70^{\circ}C$	$\Delta V_{IO}/\Delta T$	---	7.0	---	$\mu V/^{\circ}C$
Input Offset Current $0^{\circ}C \leq T_A \leq 70^{\circ}C$	$I_{IO}$	---	5.0	50	nA
Avg. Temp. Coeff. of Input Offset Current $0^{\circ}C \leq T_A \leq 70^{\circ}C$	$\Delta I_{IO}/\Delta T$	---	10	---	$pA/^{\circ}C$
Input Bias Current $0^{\circ}C \leq T_A \leq 70^{\circ}C$	$I_{IB}$	---	90	250	nA
Input Common Mode Voltage Range (1) $0^{\circ}C \leq T_A \leq 70^{\circ}C$	$V_{ICR}$	0	---	$V_{CC} - 1.7$	V
		0	---	$V_{CC} - 2.0$	V
Differential Input Voltage Range	$V_{IDR}$	---	---	$V_{CC}$	V

## ELECTRICAL CHARACTERISTICS

$V_{CC} = 5.0V$ ,  $V_{EE} = GND$ ,  $T_A = 25^\circ C$  (unless otherwise noted)

Item	Symbol	Min	Typ	Max	Unit
Large Signal Open Loop Voltage Gain $R_L \geq 2.0k\Omega$ , $V_{CC} = 15V$ $0^\circ C \leq T_A \leq 70^\circ C$	$A_{VOL}$	25	100	---	V/mV
Channel Separation $10kHz \leq f \leq 20kHz$ , Input Referenced	CS	---	-120	---	dB
Common Mode Rejection $R_S \leq 10k\Omega$	CMR	65	70	---	dB
Power Supply Rejection	PSR	65	100	---	dB
Output Voltage - High Limit $R_L \geq 2.0k\Omega$ , $V_{CC} = 5.0V$ $T_A = 25^\circ C$ $R_L \geq 2.0k\Omega$ , $V_{CC} = 30V$ $0^\circ C \leq T_A \leq 70^\circ C$ $R_L \geq 10k\Omega$ , $V_{CC} = 30V$ $0^\circ C \leq T_A \leq 70^\circ C$	$V_{OH}$	3.3 26 27	3.5 ---	---	V
Output Voltage - Low Limit $R_L \geq 10k\Omega$ , $V_{CC} = 5.0V$ $0^\circ C \leq T_A \leq 70^\circ C$	$V_{OL}$	---	5.0	20	mV
Output Source Current $V_{ID} = 1.0V$ , $V_{CC} = 15V$ $T_A = 25^\circ C$ $0^\circ C \leq T_A \leq 70^\circ C$	$I_{O+}$	20 10	40 20	---	mA
Output Source Current $V_{ID} = -1.0V$ , $V_{CC} = 15V$ $T_A = 25^\circ C$ $0^\circ C \leq T_A \leq 70^\circ C$ $V_{ID} = -1.0V$ , $V_O = 200mV$ $T_A = 25^\circ C$	$I_{O-}$	10 5.0 12	20 8.0 50	---	mA  $\mu A$
Output Short Circuit to Ground	$I_{SC}$	---	40	60	mV
Power Supply Current $R_L = \infty\Omega$ , $V_{CC} = 30V$ , $V_O = 0V$ , $0^\circ C \leq T_A \leq 70^\circ C$ $R_L = \infty\Omega$ , $V_{CC} = 5.0V$ , $V_O = 0V$ , $0^\circ C \leq T_A \leq 70^\circ C$					mA