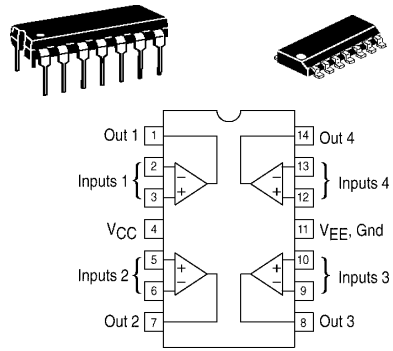
LM324 Quad Differential Input Operational Amplifier

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 ±16	V
Input Differential Voltage Range	V_{IDR}	±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	°C
Operating Junction Temperature	T_J	150	°C
Storage Temperature Range	T_S	-65 to 150	°C

ELECTRICAL CHARACTERISTICS

V_{CC} = 5.0V, V_{EE} = GND, T_A = 25°C (unless otherwise noted)

Item	Symbol	Min	Typ	Max	Unit
Input Offset Voltage	V_{IO}	---	2.0	7.0	mV
$0°C \le T_A \le 70°C$		---	---	9.0	
Avg. Temp. Coeff. of Input Offset Voltage	$\Delta V_{IO}/\Delta T$				
$0°C \le T_A \le 70°C$		---	7.0	---	µV/°C
Input Offset Current	I_{IO}	---	5.0	50	nA
$0°C \le T_A \le 70°C$		---	---	150	
Avg. Temp. Coeff. of Input Offset Current	$\Delta I_{IO}/\Delta T$				
$0°C \le T_A \le 70°C$		---	10	---	pA/°C
Input Bias Current	I_{IB}	---	90	250	nA
$0°C \le T_A \le 70°C$		---	---	500	
Input Common Mode Voltage Range (1)	V_{ICR}	0	---	V_{CC}-1.7	V
$0°C \le T_A \le 70°C$		0	---	V_{CC}-2.0	
Differential Input Voltage Range	V_{IDR}	---	---	V_{CC}	V

ELECTRICAL CHARACTERISTICS

V_{CC} = 5.0V, V_{EE} = GND, T_A = 25°C (unless otherwise noted)

Item	Symbol	Min	Typ	Max	Unit
Large Signal Open Loop Voltage Gain $R_L \geq 2.0k\Omega$, V_{CC} = 15 V 0°C ≤ T_A ≤ 70°C	A_{VOL}	25	100	---	V/mV
Channel Separation 10kHz ≤ f ≤ 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} = 5.0 V T_A = 25°C $R_L \geq 2.0k\Omega$, V_{CC} = 30 V 0°C ≤ T_A ≤ 70°C $R_L \geq 10k\Omega$, V_{CC} = 30 V 0°C ≤ T_A ≤ 70°C	V_{OH}	 3.3 26 27	 3.5 --- 28	 --- --- ---	V
Output Voltage - Low Limit $R_L \geq 10k\Omega$, V_{CC} = 5.0 V 0°C ≤ T_A ≤ 70°C	V_{OL}	 ---	 5.0	 20	mV
Output Source Current V_{ID} = 1.0V, V_{CC} = 15 V T_A = 25°C 0°C ≤ T_A ≤ 70°C	I_{O+}	 20 10	 40 20	 --- ---	mA
Output Source Current V_{ID} = -1.0V, V_{CC} = 15 V T_A = 25°C 0°C ≤ T_A ≤ 70°C V_{ID} = -1.0V, V_O = 200 mV T_A = 25°C	I_{O-}	 10 5.0 12	 20 8.0 50	 --- --- ---	mA µA
Output Short Circuit to Ground	I_{SC}	---	40	60	mV
Power Supply Current R_L = ∞Ω, V_{CC} = 30 V, V_O = 0V, 0°C ≤ T_A ≤ 70°C R_L = ∞Ω, V_{CC} = 5.0 V, V_O = 0V, 0°C ≤ T_A ≤ 70°C					mA