

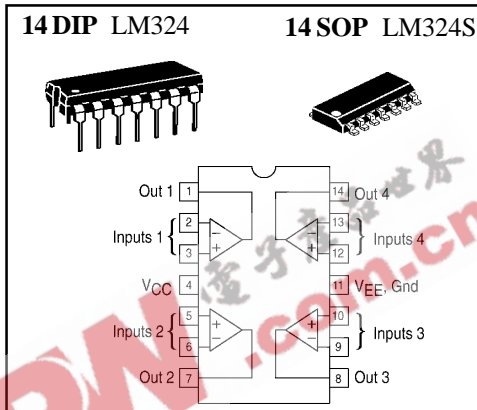


LM324 Quad Differential Input Operational Amplifier

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



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	$^{\circ}\text{C}$
Operating Junction Temperature	T_J	150	$^{\circ}\text{C}$
Storage Temperature Range	T_S	-65 to 150	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS

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

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



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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 μA
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