

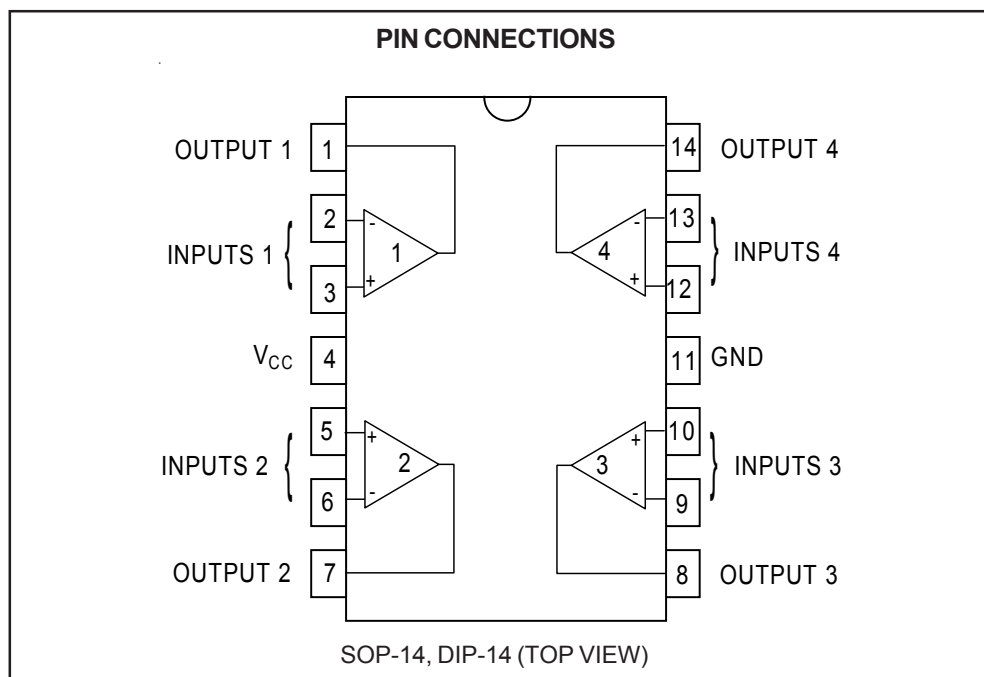
LOW POWER QUAD OPERATIONAL AMPLIFIERS

- Internally frequency compensated for unity gain
- Large DC voltage gain 100 dB
- Wide bandwidth (unity gain) 1 MHz (temperature compensated)
- Power Supply Range: Single supply 3V to 32V
- Very low supply current drain (700 μ A)—essentially independent of supply voltage
- Low input biasing current 45 nA (temperature compensated)
- Low input offset voltage 2 mV and offset current: 5 nA
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the powersupply voltage
- Large output voltage swing 0V to $V^+ - 1.5V$

The GM324 series are low-cost, quad internally frequency compensated operational amplifiers with true differential inputs, which operate from a single power supply over a wide range of voltages. They have several distinct advantages over standard operational amplifier types in single supply applications. The quad amplifier can operate at supply voltages as low as 3.0V or as high as 32V with extremely low quiescent current (on a per amplifier basis). The common mode input range includes the negative supply, thereby eliminating the necessity for external biasing components in many applications. The output voltage range also includes the negative power supply voltage.

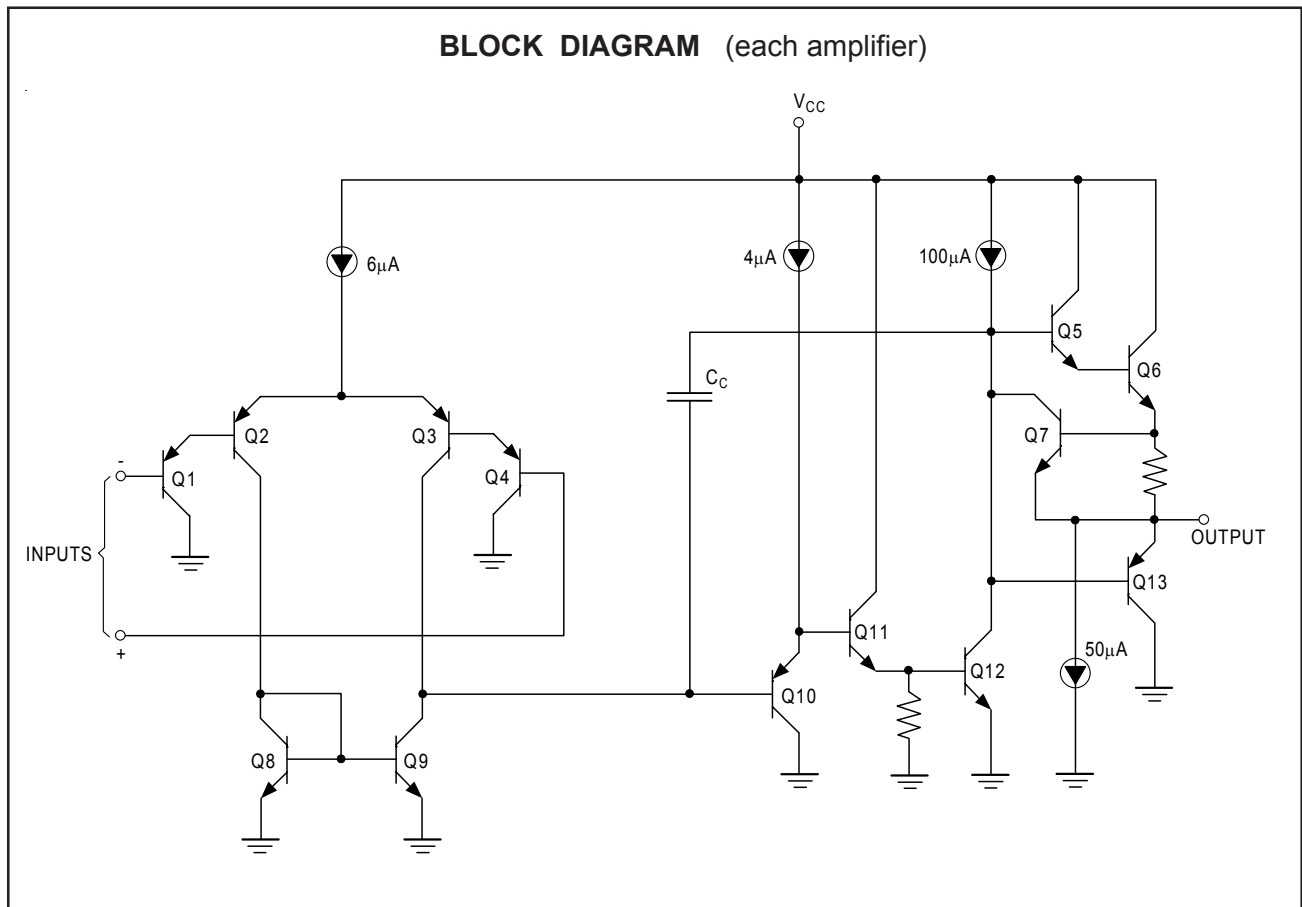
Application areas include transducer amplifiers, DC gain blocks and all the conventional op-amp circuits which now can be more easily implemented in single power supply systems. For example, the GM324 series can be directly operated off of the standard +5V power supply voltage which is used in digital systems and will easily provide the required interface electronics without requiring the additional $\pm 15V$ power supplies.

The GM324 is available in DIP-14 and SOP-14 packages.



LOW POWER QUAD OPERATIONAL AMPLIFIERS
■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE	UNITS
Supply Voltage	32	V
Differential Input Voltage	32	V
Input Current	50	mA
Input Voltage	-0.3 to +32	V
Power Dissipation	800	mW
Operating Temperature Range	0 to +70	°C
Storage Temperature Range	-65 to +150	°C
Lead Temperature (soldering 10 sec.)	260	°C



LOW POWER QUAD OPERATIONAL AMPLIFIERS
■ ELECTRICAL CHARACTERISTICS

 ($V_{CC} = 5V$, at specified free-air temperature, unless otherwise specified)

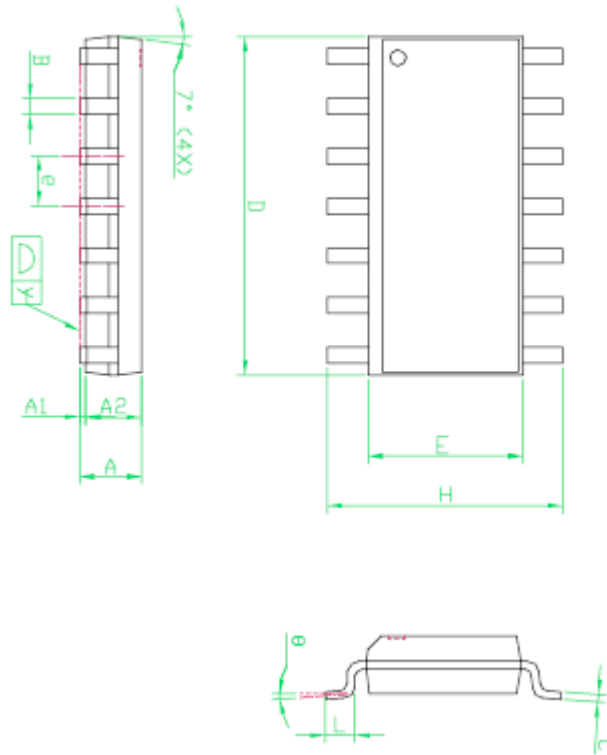
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	$V_{CC}=5V$ to MAX	25°C	3	7	mV
			Full range		9	
Average Temperature coefficient of Input Offset Voltage	αV_{IO}		Full range	7		$\mu V/^\circ C$
Input Offset Current	I_{IO}	$V_O = 1.4V$	25°C	2	50	nA
			Full range		150	
Average Temperature coefficient of Input Offset Current	αI_{IO}		Full range	10		$pA/^\circ C$
Input Bias Current	I_{BIAS}	$V_O = 1.4V$	25°C	-20	-250	nA
			Full range		-500	
Common-Mode Input Voltage Range	V_{ICR}	$V_{CC}=5V$ to MAX	25°C	0 to $V_{CC}-1.5$		V
			Full range	0 to $V_{CC}-2$		
High - Level Output Voltage	V_{OH}	$R_L \geq 2k\Omega$	25°C	$V_{CC}-1.5$		V
		$V_{CC} = MAX, R_L = 2k\Omega$	Full range	26		
		$V_{CC} = MAX, R_L \geq 10k\Omega$	Full range	27	28	
Low - Level Output Voltage	V_{OL}	$R_L \geq 10k\Omega$	Full range	5	20	mV
Large-Signal Differential Voltage Amplification	A_{VD}	$V_{CC}=15V, V_O=1V$ to 11V, $R_L \geq 2k\Omega$	25°C	25	100	V/mV
			Full range	15		
Common Mode Rejection Ratio	CMRR	$V_{CC}=5V$ to MAX, $V_{IC} = V_{ICR}$ min	25°C	65	80	dB
Supply Voltage Rejection Ratio	k_{SVR}	$V_{CC}=5V$ to MAX	25°C	65	100	dB
Crosstalk Attenuation	V_{O1} / V_{O2}	$f = 1kHz$ to 20kHz	25°C		120	dB
Output Current	I_O	$V_{CC}=15V, V_O=0, V_{ID}=1V$	25°C	-20	-30	mA
			Full range	-10		
		$V_{CC}=15V, V_O=15V, V_{ID} = -1V$	25°C	10	20	
			Full range	5		
		$V_O=200mV, V_{ID} = -1V$	25°C	12	30	μA
Short-Circuit Output Current	I_{OS}	V_{CC} at 5V, $V_O=0$, GND at -5V	25°C	± 40	± 60	mA
Supply Current (four amplifiers)	I_{CC}	$V_O = 2.5V$, no load	Full range	0.7	1.2	mA
		$V_{CC} = MAX, V_O=0.5V_{CC}$, no load	Full range	1.1	3	

* All characteristics are measured under open loop conditions with zero common-mode input voltage unless otherwise specified.
 "MAX" V_{CC} for testing purposes is 30V. Full range is 0°C to 70°C.

LOW POWER QUAD OPERATIONAL AMPLIFIERS■ **ORDERING INFORMATION**

GM324	PACKAGE	
	SOP-14	DIP-14
	GM324S14	GM324D14

LOW POWER QUAD OPERATIONAL AMPLIFIERS

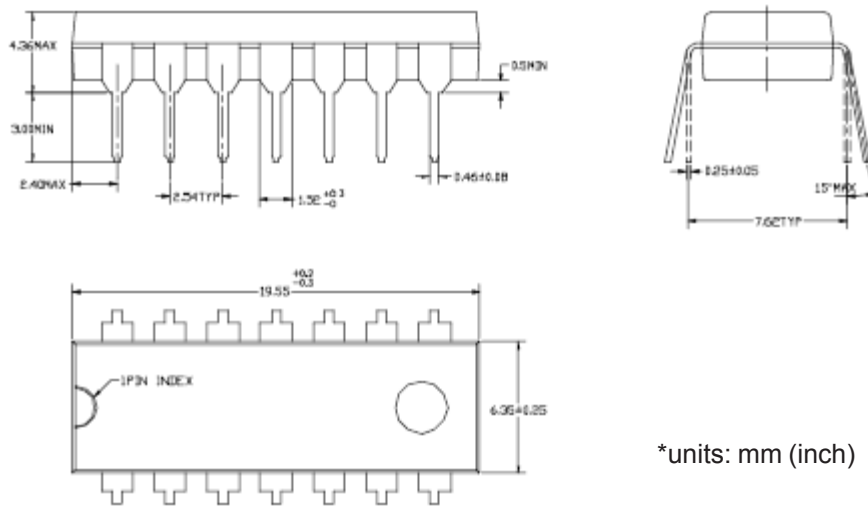
 ■ **SOP-14 PACKAGE OUTLINE DIMENSIONS**


SYMBOL	Dimensions In Millimeters			Dimensions In Inches		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	1.60	1.75	0.053	0.063	0.069
A1	0.10		0.25	0.004		0.010
A2		1.45			0.057	
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	8.55		8.75	0.337		0.344
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
L	0.40		1.27	0.016		0.050
y			0.10			0.004
θ	0°		8°	0°		8°

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS
2. DIMENSION L IS MEASURED IN GAGE PLANE
3. TOLERANCE 0.10 mm UNLESS OTHERWISE SPECIFIED
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. FOLLOWED FROM JEDEC MS-012

LOW POWER QUAD OPERATIONAL AMPLIFIERS

 ■ **DIP-14 PACKAGE OUTLINE DIMENSIONS**


LEAD PITCH	2.54mm (0.1inch)
NOMINAL DIMENSIONS	19.55 x 6.35mm (0.77x 0.25inch)
LEAD SHAPE	Gullwing
SEALING METHOD	Plastic Mold