

## Quad operational amplifiers

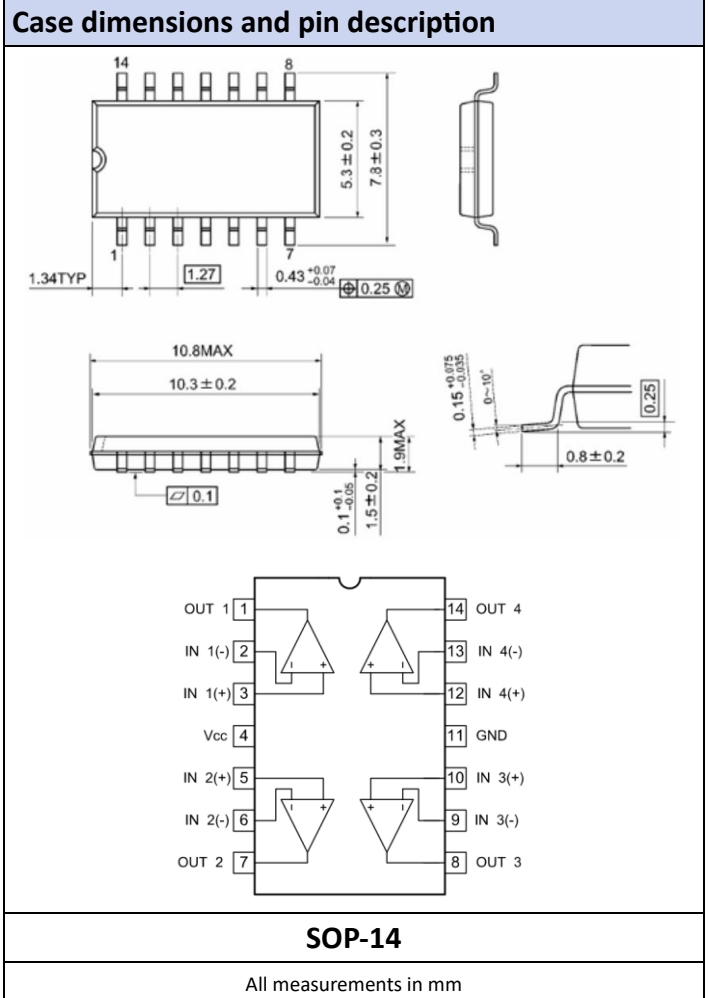
Primary characteristics		
Parameter	Value	Unit
Supply voltage	$\pm 20$	V
Power dissipation	580	mW

## Description

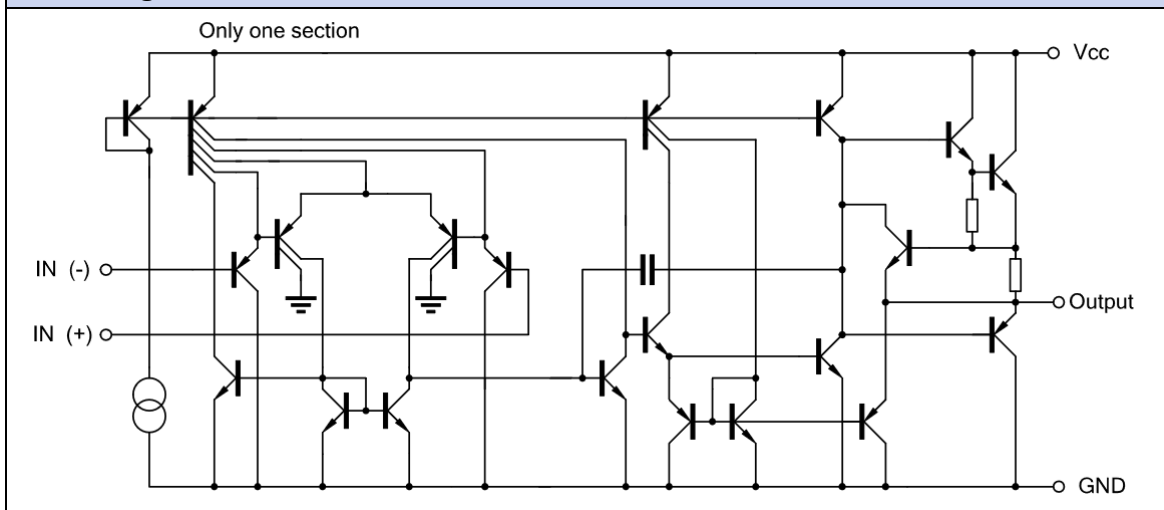
The **LM324** consists of four independent, high gain internally frequency compensated operational amplifiers which are designed specifically to operate from a single power supply over a wide voltage range. Operation from split power supplies is also possible. Application areas include transducer amplifier, DC gain blocks and all the conventional OP amp circuits which now can be easily implemented in single power supply system.

## Features

- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB
- Wide operating supply range ( $V_{CC}=3.0V\sim 40V$ )
- Input common-mode voltage includes ground
- Large output voltage swing: from 0V to  $V_{CC}-1.5V$
- Power drain suitable for battery operation



### Block diagram



**Absolute maximum ratings**

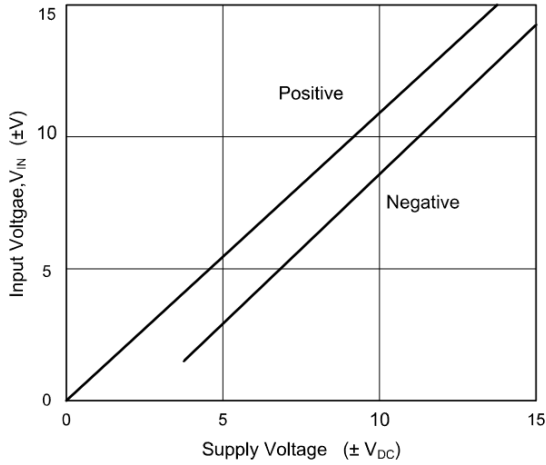
Parameter	Symbol	Value	Unit
Supply voltage	$V_{CC}$	$\pm 20$	V
Differential input voltage	$V_{I(DIFF)}$	40	V
Input voltage	$V_{IN}$	-0.3 ~ +40	V
Power dissipation	$P_D$	580	mW
Operating temperature	$T_{OPR}$	-20 ~ +85	°C
Storage temperature	$T_{STG}$	-40 ~ +150	°C

**Electrical characteristics**
 $V_{CC}=5.0V$ , all voltage referenced to GND unless otherwise specified.

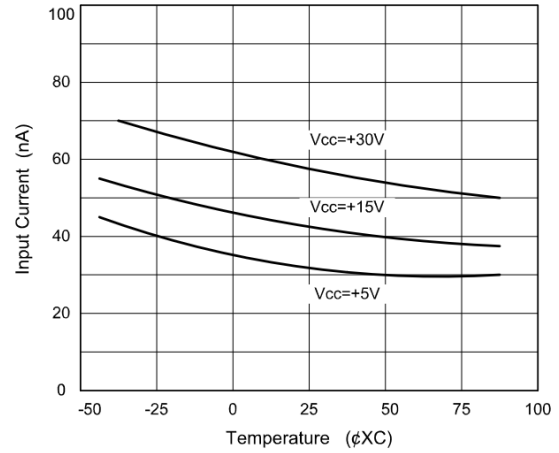
Parameter	Symbol	Test conditions	Value			Unit
			Min.	Typ.	Max.	
Input offset voltage	$V_{I(OFF)}$	$V_{CM}=0V$ to $V_{CC}-1.5V$ $V_{O(P)}=1.4V$ , $R_S=0\Omega$	-	-	7.0	mV
Input offset current	$I_{I(OFF)}$		-	-	50	nA
Input bias current	$I_{I(BIAS)}$		-	-	250	nA
Input common mode voltage	$V_{I(CM)}$	$V_{CC}=30V$	0	$V_{CC}-1.5$	-	V
Power supply current	$I_{CC}$	$R_L=\infty$ , $V_{CC}=30V$	-	1.0	3.0	mA
		$V_{CC}=5.0V$	-	0.7	1.2	mA
Large signal voltage gain	$G_V$	$V_{CC}=30V$ , $R_L=2.0k\Omega$	25	100	-	V/mV
Output voltage swing	$V_{O(H)}$	$V_{CC}=30V$ , $R_L=2.0k\Omega$	26	-	-	V
		$V_{CC}=30V$ , $R_L=10k\Omega$	27	28	-	
	$V_{O(L)}$	$V_{CC}=30V$ , $R_L=10k\Omega$	-	5.0	20	mV
Common mode rejection ratio	CMRR		65	75	-	dB
Power supply rejection ratio	PSRR		65	100	-	dB
Channel separation	CS	$f=1.0kHz \sim 20kHz$	-	120	-	dB
Short circuit current to ground	$I_{SC}$		-	40	60	mA
Output current	$I_{SOURCE}$	$V_{I(+)}=1.0V$ , $V_{I(-)}=0V$ $V_{CC}=15V$ , $V_{O(P)}=2.0V$	20	40	-	mA
	$I_{SINK}$	$V_{I(+)}=0V$ , $V_{I(-)}=1.0V$ $V_{CC}=15V$ , $V_{O(P)}=2.0V$	10	13	-	mA
		$V_{I(+)}=0V$ , $V_{I(-)}=1.0V$ $V_{CC}=15V$ , $V_{O(P)}=200mV$	12	45	-	$\mu A$
Differential input voltage	$V_{I(DIFF)}$		-	-	$V_{CC}$	V

Typical characteristics

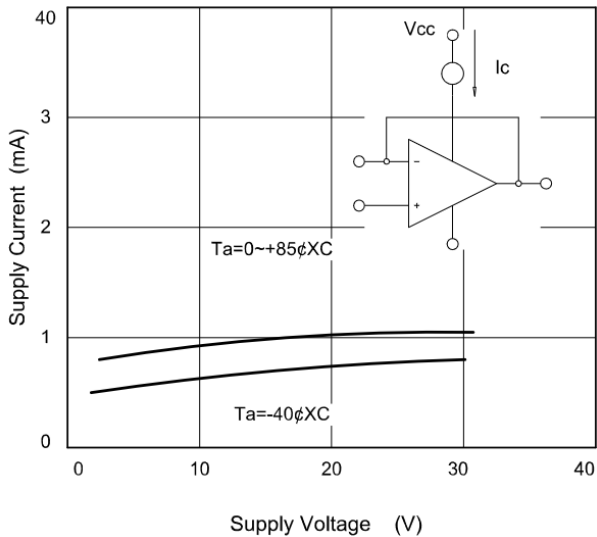
Input voltage range



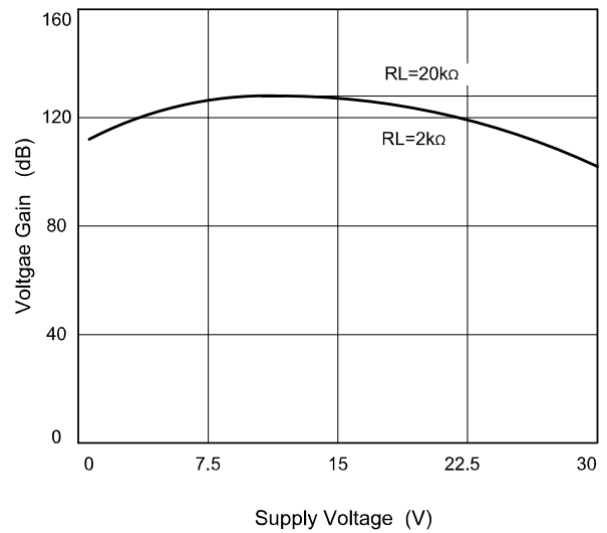
Input current



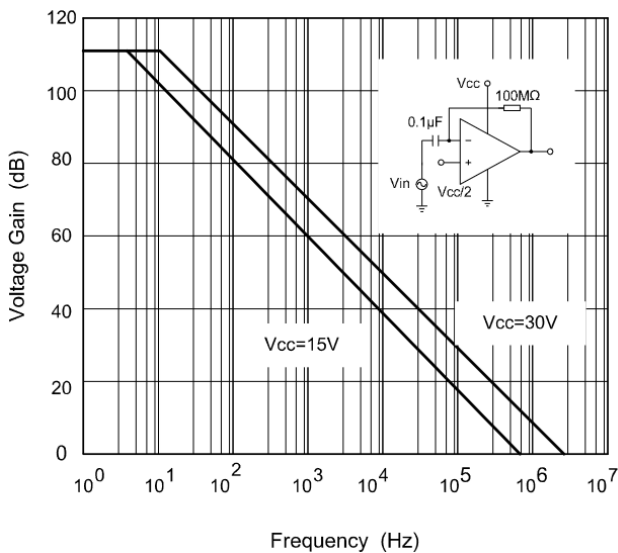
Supply current



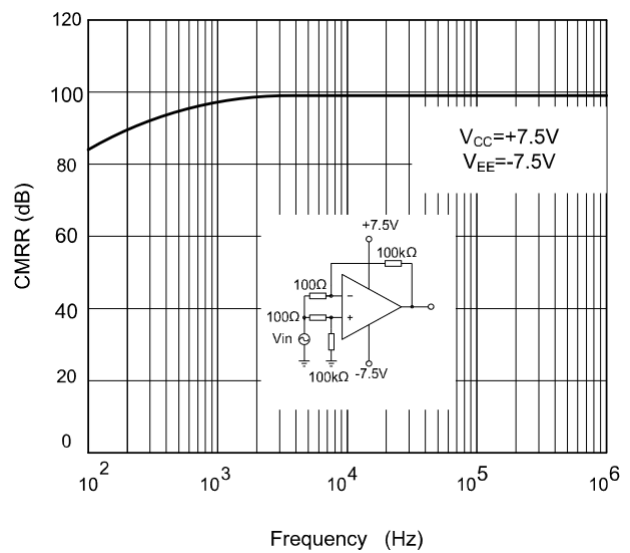
Voltage gain



Open loop frequency response

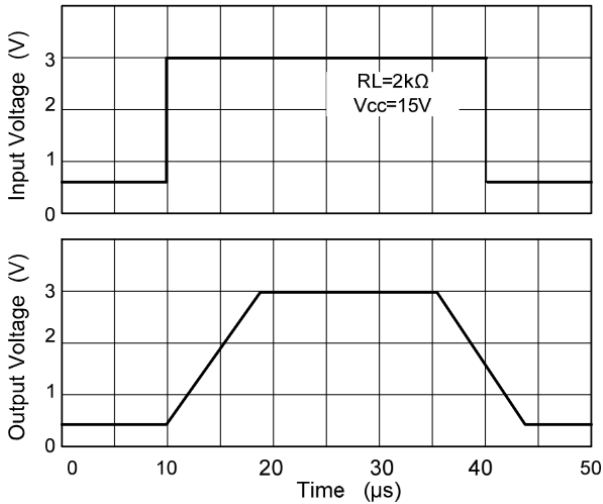


Common-mode rejection ratio

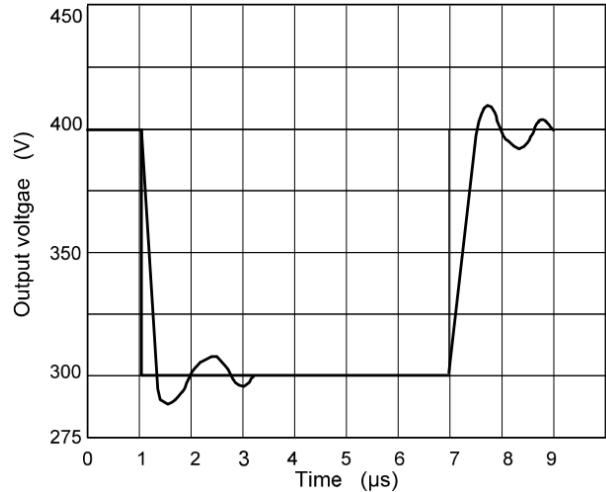


Typical characteristics

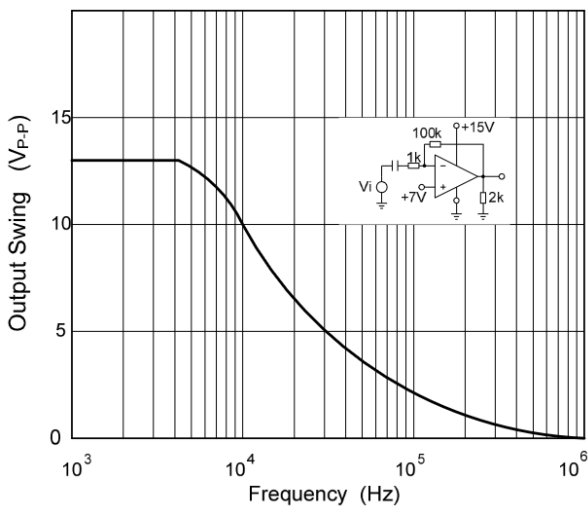
Voltage follower pulse response



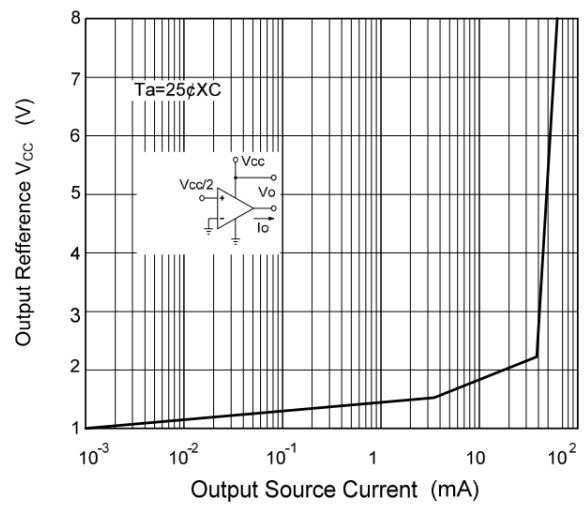
Voltage follower pulse response (small signal)

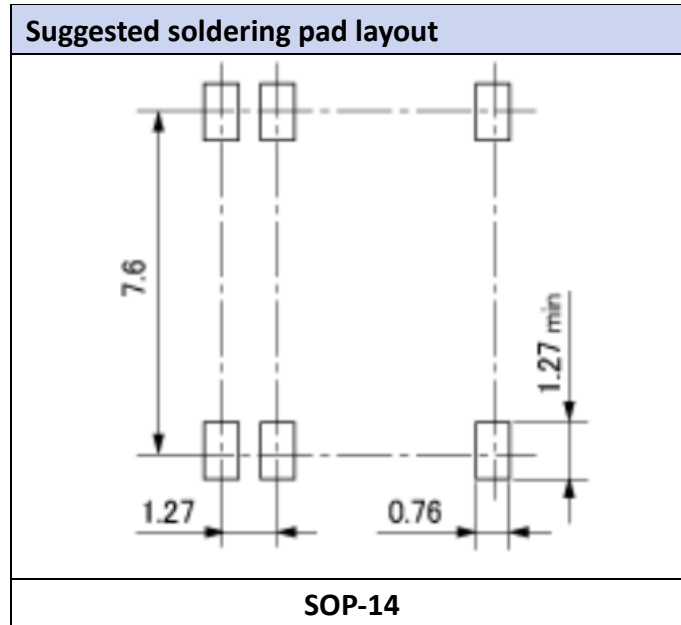


Large signal frequency response



Output characteristics current sourcing





Ordering information			
Part Number	Package	Shipping Quantity	Dimensions
LM324L-S14-R	SOP-14	2500	---

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