Quad Operational Amplifiers

◆ Description

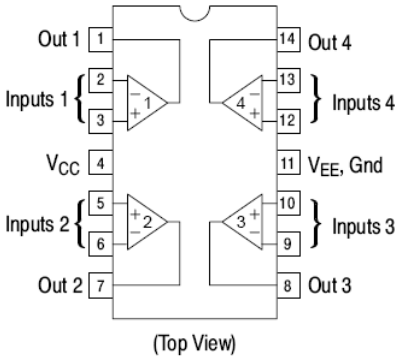
The ET-LM324 consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits.

◆ Features

- Wide Range of Supply Voltages.
- Low Supply Current Drain Independent of Supply Voltage.
- Low Input Biasing Current.
- Low Input Offset Voltage and Offset Current.
- Input Common-mode Voltage Range Equal to The Includes Ground.
- Differential Input Voltage Range Equal to The Power Supply Voltage.
- DC Voltage Gain 100V/mV Typical.
- Internally Frequency Compensation.

◆ Pin Description



◆ Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply

◆ Ordering Information

Part Number	Operating Temperature Range	Package	Packing
LM324KC	0 °C ~ +70 °C	SOP-14	Tape & Reel
LM324JC		DIP-14	Tube

◆ Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V_{CC}	Power Supply Voltages	Single Supply	32	V
V_{CC}, V_{EE}		Split Supplies	±16	
V_{IDR}	Input Differential Voltage Range (Split Power Supplies)		±32	V
V_{ICR}	Input Common Mode Voltage Range		-0.3~32	V
T_J	Junction Temperature		150	°C
T_{STG}	Storage Temperature (T_A=+25°C)		-55 ~ +125	°C
T_L	Lead Temperature, 1mm from Case for 10 Senconds		260	°C

◆ Thermal Characteristics

Symbol	Parameter	Package	Typical Value	Unit
θ_{JA}	Thermal Resistance From Junction to Ambient in Free Air. (Measured with the component mounted on a high effective thermal conductivity test board in free air.)	SOP-14	160	°C/W
		DIP-14	125	

◆ Electrical Characteristics (T_A=25 °C, V_{CC}=5.0V, V_{EE}=Gnd, unless otherwise noted .)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{IO}	Maximum Input Offset Voltage	V_{CC}=5V to 30V; RS=0Ω; V_O=1.4V V_{ICR}=0V to (V_{CC}-1.5V)	-	-	7.0	mV
		V_{CC}=5V to 30V; RS=0Ω; V_O=1.4V V_{ICR}=0V to (V_{CC}-2.0V)	-	-	9.0	
I_{IO}	Maximum Input Offset Current	V_{CC}=5.0V to 30V V_O=1.4V	-	-	±50	nA
			-	-	±150	
I_{IB}	Maximum Input Bias Current	V_{CC}=5.0V to 30V V_O=1.4V	-	-	-250	nA
			-	-	-500	
V_{ICR}	Common-mode Input Voltage Range	V_{CC}=30V	-	-	V_{CC}-1.5	V
			-	-	V_{CC}-2.0	
I_{CC}	Maximum Power Supply Current	RL=∞, V_{CC}=5V, V_O=2.5V	-	-	1.2	mA
		RL=∞, V_{CC}=30V, V_O=15V	-	-	3.0	
A_{VOL}	Minimum Large Signal Open-Loop Vol. Gain	V_{CC}=15V, R_L≥2kΩ	25	-	-	V/mV
V_{OH}	Minimum Output High-Level Vol. Swing	V_{CC}=5V, R_L=2KΩ	3.3	-	-	V
		V_{CC}=30V, R_L=2KΩ	26	-	-	
		V_{CC}=30V, R_L=10KΩ	27	-	-	
V_{OL}	Maximum Output High-Level Vol. Swing	V_{CC}=5V, R_L=10KΩ	-	-	20	mV
A_{VOL}	Minimum Large Signal Open-Loop Vol. Gain	V_{CC}=15V, R_L≥2kΩ	25	-	-	V/mV
			15	-	-	
CMR	Common-mode Rejection	V_{CC}=5V to 30V, R_S=10KΩ	65	-	-	dB
PSR	Power Supply Rejection	V_{CC}=5V to 30V	65	-	-	dB
I_{SC}	Maximum Output Short Circuit to Gnd	V_{CC}=5V, V_O=0V	-	-	60	mA
I_{O+}	Minimum Output Source Current	V_{CC}=15V, V_{ID-}=1.0V	20	-	-	mA
I_{O-}	Minimum Output Sink Current	V_{ID}=-1.0V, V_{CC}=15V, V_O=15V	10	-	-	mA
		V_{ID}=-1.0V, V_{CC}=15V, V_O=0.2V	12	-	-	uA
V_{IDR}	Differential Input Voltage Range	All V_{IN}≥Gnd or V-Supply (if used)	-	-	V_{CC}	V

◆ Typical Characteristics

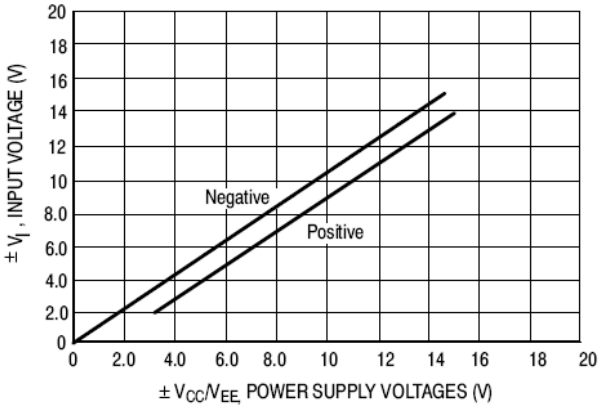


Figure 4. Input Voltage Range

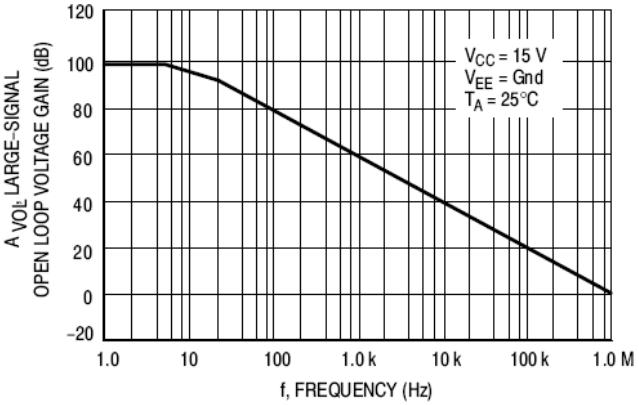


Figure 5. Open Loop Frequency

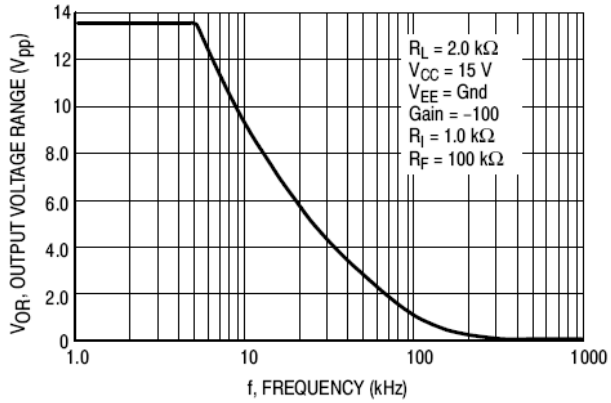


Figure 6. Large–Signal Frequency Response

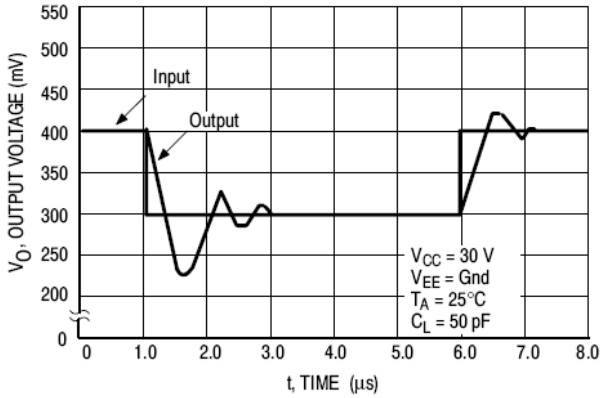


Figure 7. Small–Signal Voltage Follower Pulse Response (Noninverting)

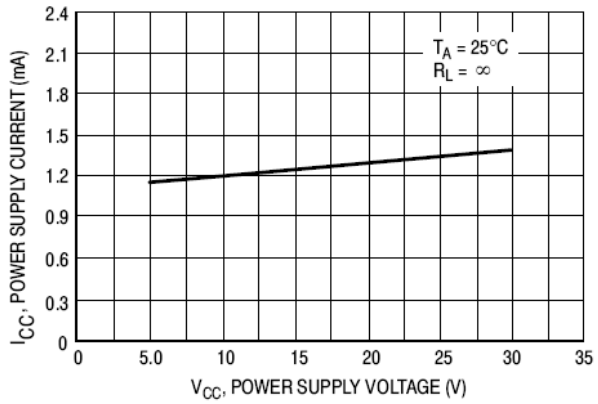


Figure 8. Power Supply Current versus Power Supply Voltage

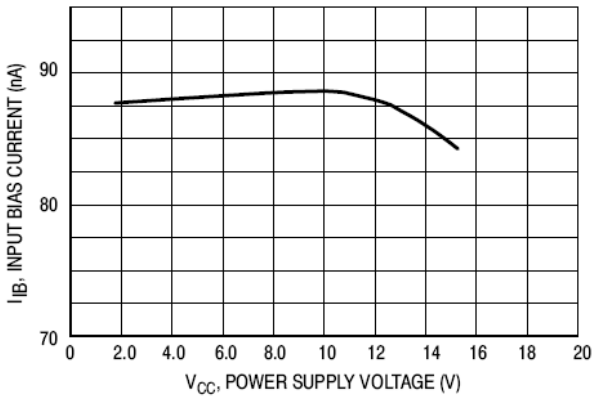
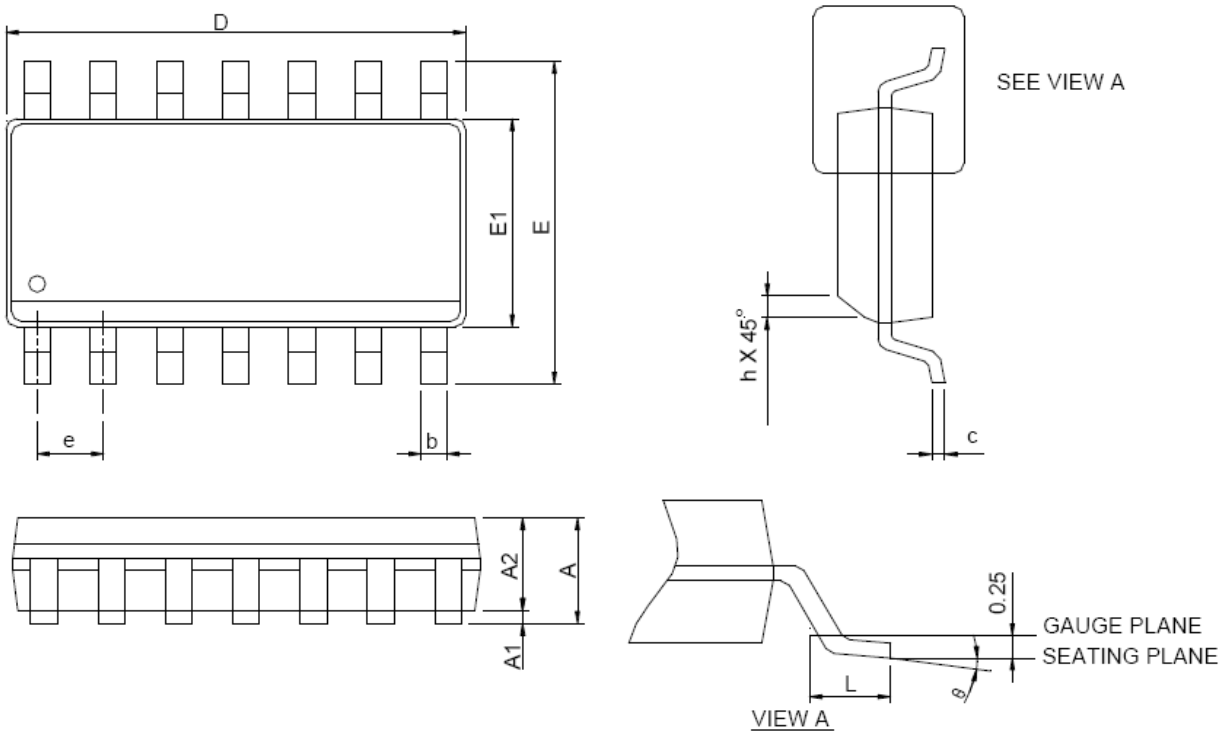


Figure 9. Input Bias Current versus Power Supply Voltage

◆ Package Information

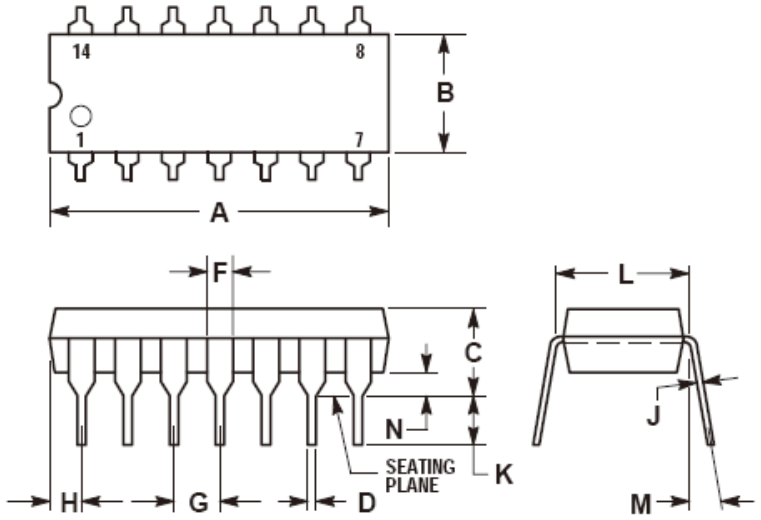
SOP-14



SYMBOL	SOP-14			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.75		0.069
A1	0.10	0.25	0.004	0.010
A2	1.25		0.049	
b	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	8.55	8.75	0.337	0.344
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

◆ Package Information

DIP-14



SYMBOL	DIP-14			
	MILLIMETERS		INCHS	
	MIN.	MAX.	MIN.	MAX.
A	18.16	19.56	0.715	0.770
B	6.10	6.60	0.240	0.260
C	3.69	4.69	0.145	0.185
D	0.38	0.53	0.015	0.021
F	1.02	1.78	0.040	0.070
G	2.54BSC		0.100BSC	
H	1.32	2.41	0.052	0.095
J	0.20	0.38	0.008	0.015
K	2.92	3.43	0.115	0.135
L	7.62BSC		0.300BSC	
M	0^o	10^o	0^o	10^o
N	0.39	1.01	0.015	0.039