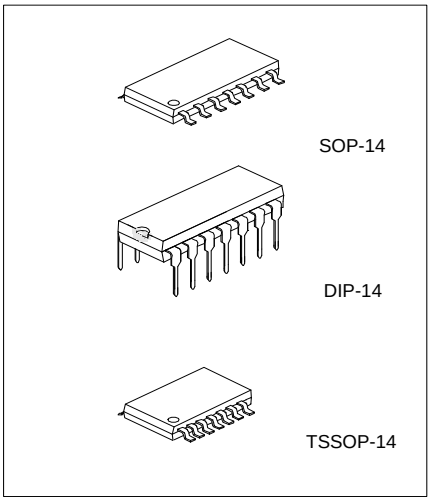
LM324

LINEAR INTEGRATED CIRCUIT

QUAD OPERATIONAL AMPLIFIERS



Lead-free: LM324L
Halogen-free: LM324G

■ DESCRIPTION

The UTC **LM324** consists of four independent, high gain internally frequency compensated operational amplifiers which are designed specifically to operated 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 (Vcc=3V~32V).
*Input common-mode voltage includes ground.
*Large output voltage swing: From 0V to Vcc-1.5V.
*Power drain suitable for battery operation.

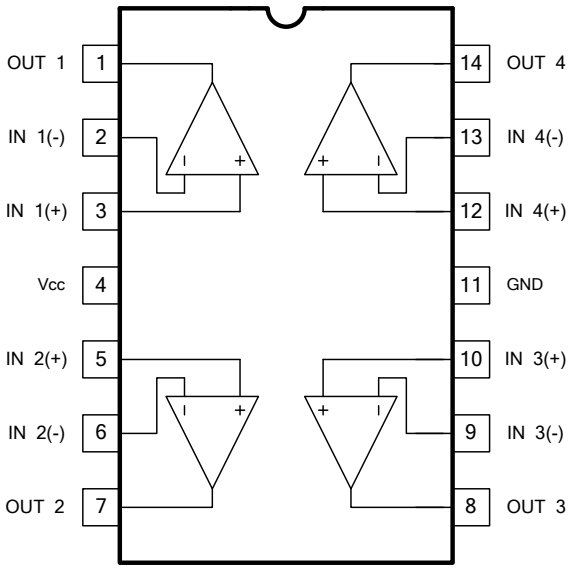
■ ORDERING INFORMATION

Ordering Number			Package	Packing
Normal	Lead Free Plating	Halogen-Free		
LM324-P14-R	LM324L-P14-R	LM324G-P14-R	TSSOP-14	Tape Reel
LM324-P14-T	LM324L-P14-T	LM324G-P14-T	TSSOP-14	Tube
LM324-S14-R	LM324L-S14-R	LM324G-S14-R	SOP-14	Tape Reel
LM324-S14-T	LM324L-S14-T	LM324G-S14-T	SOP-14	Tube
LM324-D14-T	LM324L-D14-T	LM324G-D14-T	DIP-14	Tube

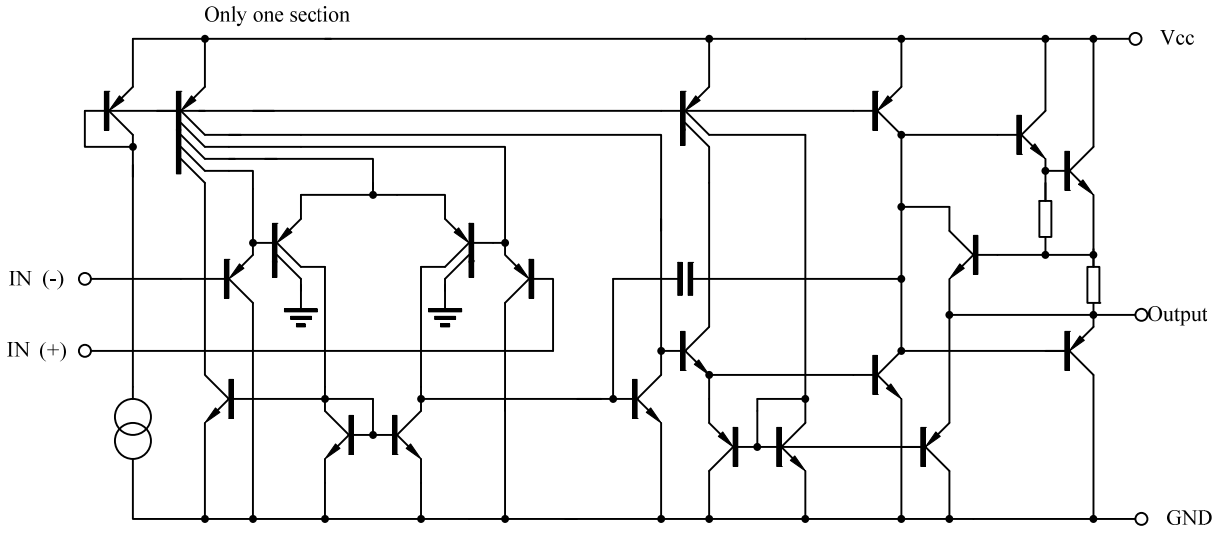
LM324L-P14-T
(1)Packing Type
(2)Package Type
(3)Lead Plating

(1) R: Tape Reel, T: Tube
(2) P14: TSSOP-14, S14: SOP-14, D14: DIP-14
(3) G: Halogen Free, L: Lead Free Plating, Blank: Pb/Sn

■ PIN DESCRIPTION



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	±18	V
Differential Input Voltage	$V_{I(DIFF)}$	32	V
Input Voltage	V_I	-0.3 ~ +32	V
Power Dissipation	P_D	570	mW
Operating Temperature Range	T_{OPR}	0 ~ +70	°C
Storage Temperature Range	T_{STG}	-40 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS

(V_{CC}=5.0V, All voltage referenced to GND unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	V_{CM}=0V toV_{CC}-1.5V $V_{O(P)}$=1.4V, R_S=0Ω			7.0	mV
Input Offset Current	I_{IO}				50	nA
Input Bias Current	I_{BIAS}				250	nA
Input Common Mode Voltage	$V_{I(R)}$	V_{CC}=30V	0	V_{CC}-1.5		V
Power Supply Current	I_{CC}	R_L=∝, V_{CC}=30V		1.0	3.0	mA
		V_{CC}=5V		0.7	1.2	mA
Large Signal Voltage Gain	G_V	V_{CC}=15V, R_L≧2KΩ $V_{O(P)}$=1V ~ 11V	25	100		V/mV
Output Voltage Swing	$V_{O(H)}$	V_{CC}=30V, R_L=2KΩ	26			V
		V_{CC}=30V, R_L=10KΩ	27	28		V
	$V_{O(L)}$	V_{CC}=5V, R_L>10KΩ		5	20	mV
Common Mode Rejection Ratio	CMRR		65	75		dB
Power Supply Rejection Ratio	PSRR		65	100		dB
Channel Separation	CS	f=1KHZ ~ 20KHZ		120		dB
Short Circuit Current to Ground	I_{SC}			40	60	mA
Output Current	I_{SOURCE}	V_I(+)=1V, V_I(-)=0V V_{CC}=15V, $V_{O(P)}$=2V	20	40		mA
	I_{SINK}	V_I(+)=0V, V_I(-)=1V V_{CC}=15V, V_O(P)=2V	10	13		mA
		V_I(+)=0V, V_I(-)=1V V_{CC}=15V, $V_{O(P)}$=200mV	12	45		mA
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}	V

■ TYPICAL CHARACTERISTICS

Fig.1 Input Voltage Range

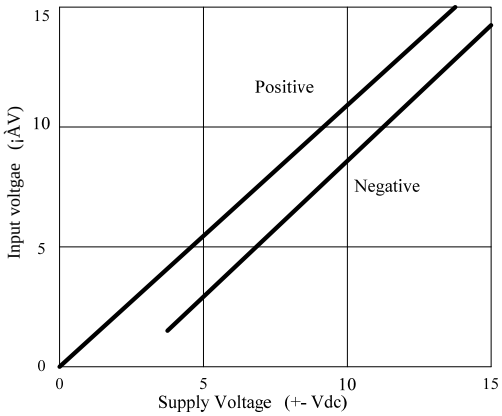


Fig.2 Input Current

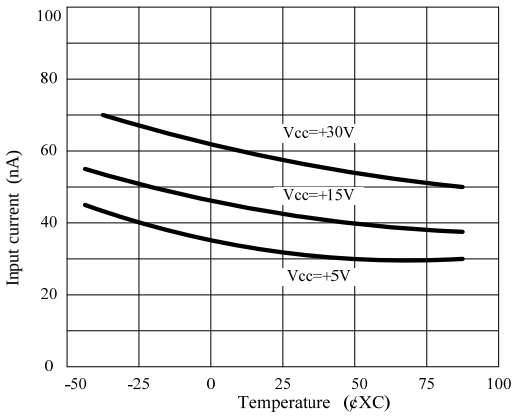


Fig.3 Supply Current

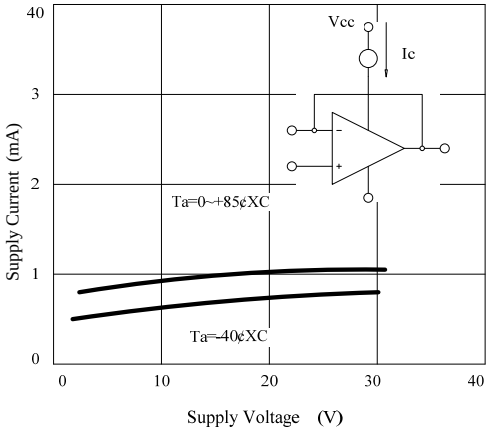


Fig.4 Voltage Gain

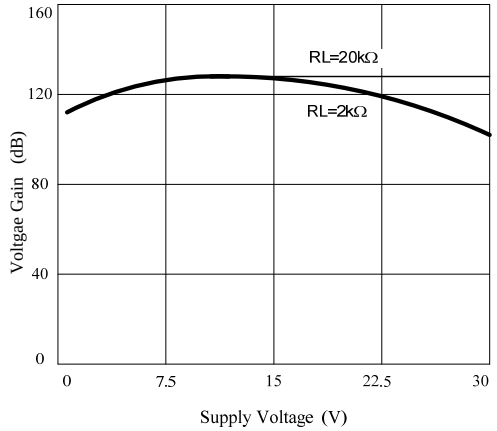


Fig.5 Open Loop Frequency response

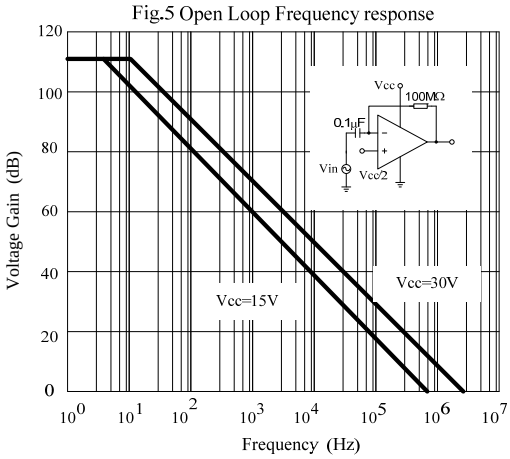
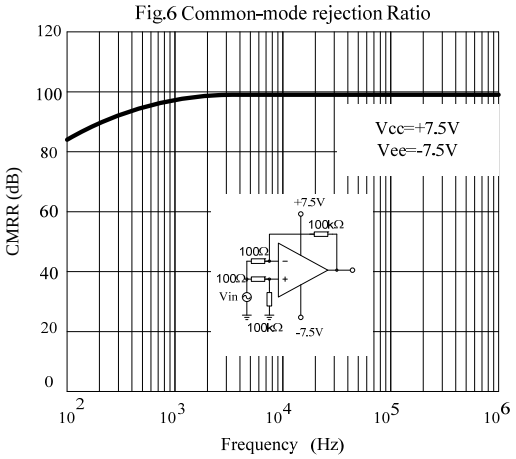


Fig.6 Common-mode rejection Ratio



■ TYPICAL CHARACTERISTICS(cont.)

Fig.7

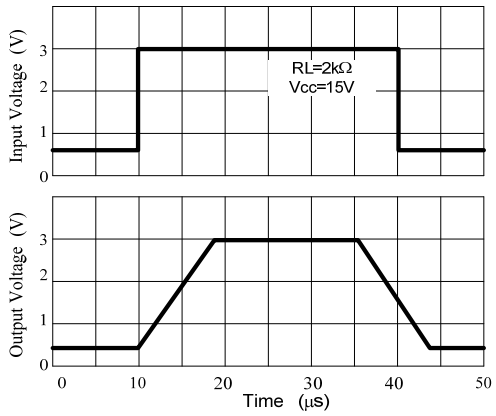


Fig.8 Voltage Follower pulse response (small signal)

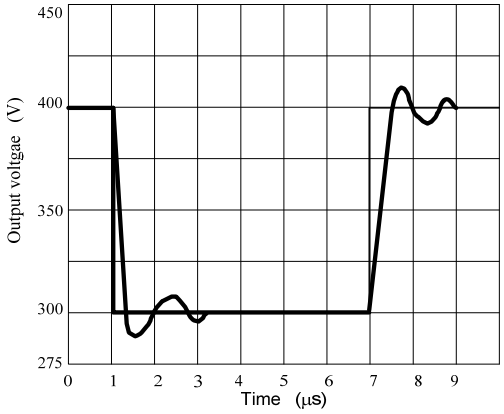


Fig.9 Large signal Frequency Response

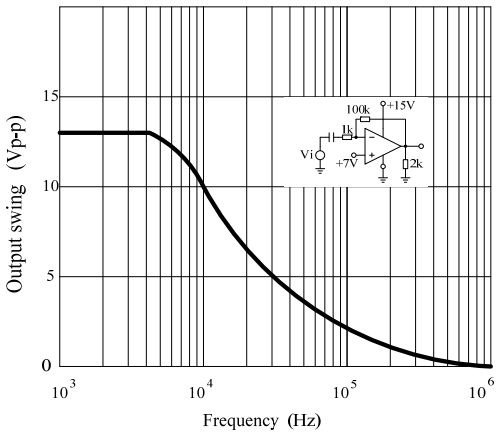


Fig.10 Output Characteristics current sourcing

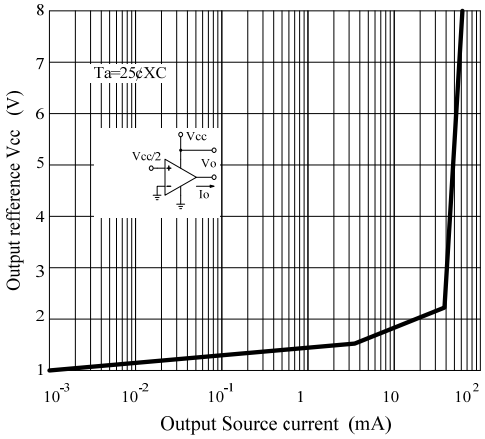


Fig.11 Output Characteristics Current sinking

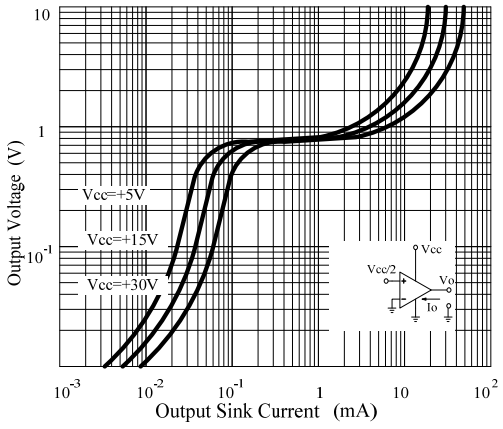


Fig.12 Current Limiting