



LM324

LINEAR INTEGRATED CIRCUIT

QUAD OPERATIONAL AMPLIFIERS

DESCRIPTION

The UTC **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.

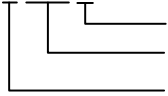
FEATURES

- *Internally frequency compensated for unity gain.
- *Large DC voltage gain :100dB.
- *Wide operating supply range ($V_{CC}=3V\sim 40V$).
- *Input common-mode voltage includes ground.
- *Large output voltage swing: From 0V to $V_{CC}-1.5V$.
- *Power drain suitable for battery operation.

ORDERING INFORMATION

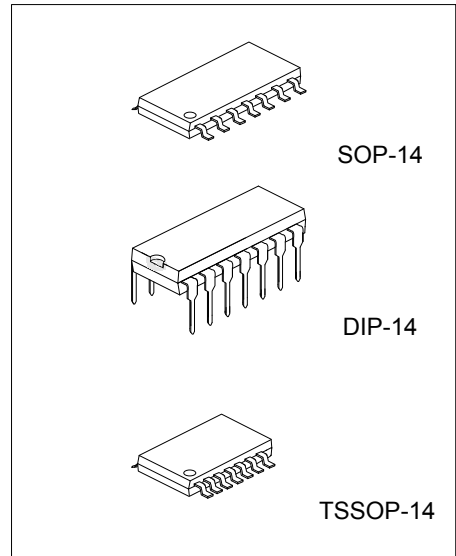
Ordering Number		Package	Packing
Lead Free	Halogen-Free		
LM324L-D14-T	LM324G-D14-T	DIP-14	Tube
LM324L-P14-R	LM324G-P14-R	TSSOP-14	Tape Reel
LM324L-P14-T	LM324G-P14-T	TSSOP-14	Tube
LM324L-S14-R	LM324G-S14-R	SOP-14	Tape Reel
LM324L-S14-T	LM324G-S14-T	SOP-14	Tube

LM324L-D14-T

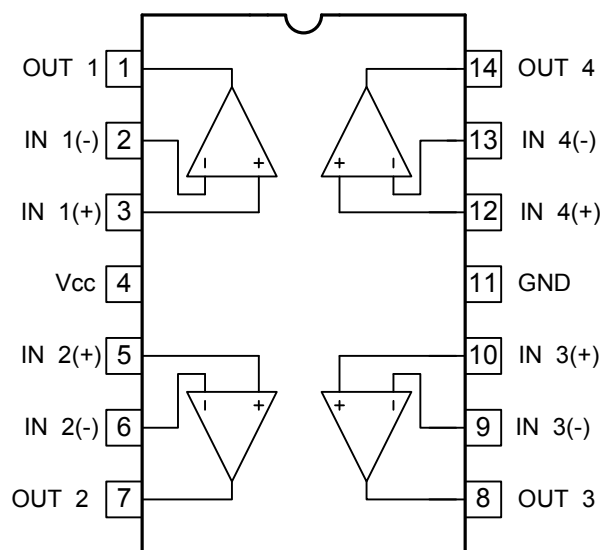


- (1) Packing Type
- (2) Package Type
- (3) Lead Free

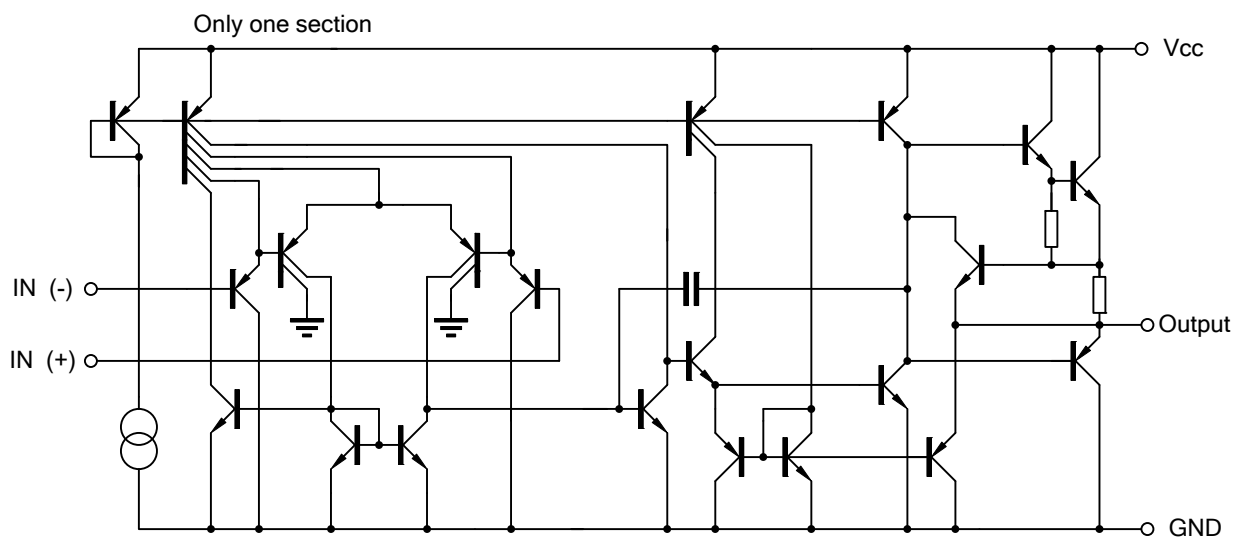
- (1) R: Tape Reel, T: Tube
- (2) D14: DIP-14, P14: TSSOP-14, S14: SOP-14
- (3) G: Halogen Free, L: Lead Free



■ PIN DESCRIPTION



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CC}	± 20	V
Differential Input Voltage		$V_{I(DIFF)}$	± 40	V
Input Voltage		V_{IN}	$-0.3 \sim +40$	V
Power Dissipation	DIP-14	P_D	800	mW
	SOP-14		580	mW
	TSSOP-14		460	mW
Operating Temperature		T_{OPR}	$-20 \sim +85$	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	$-40 \sim +150$	$^{\circ}\text{C}$

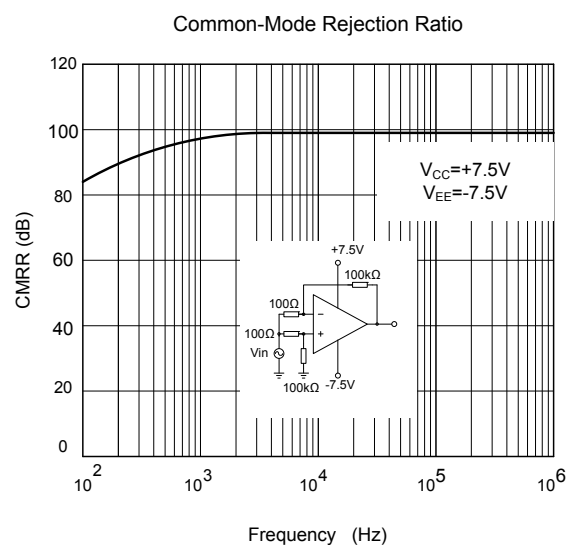
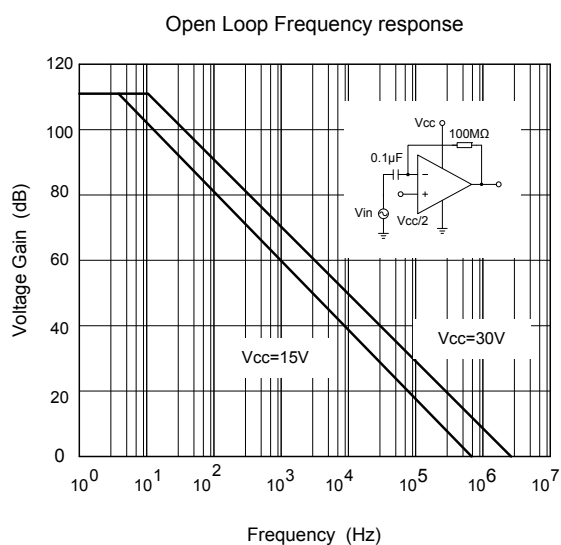
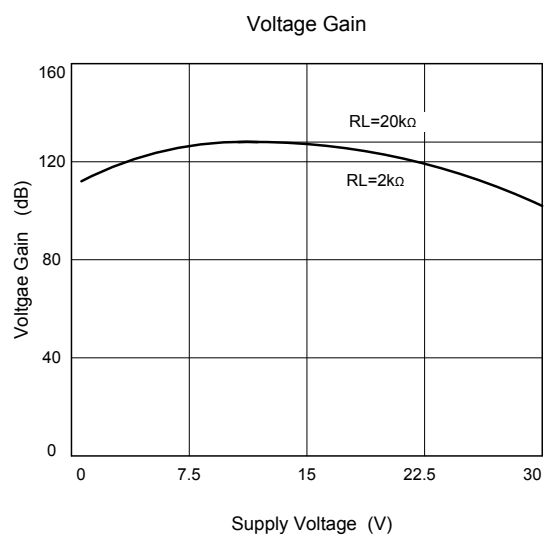
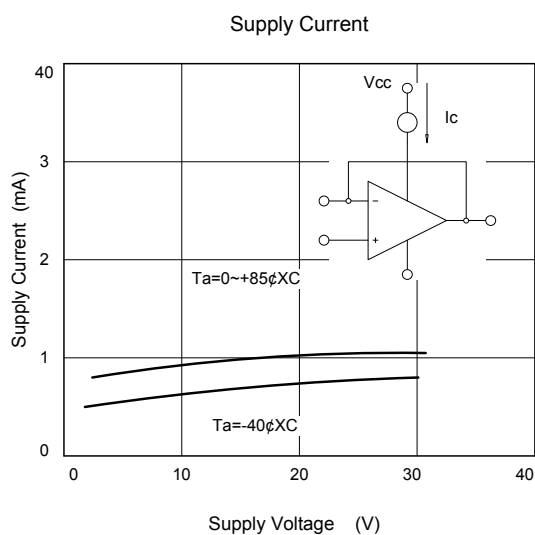
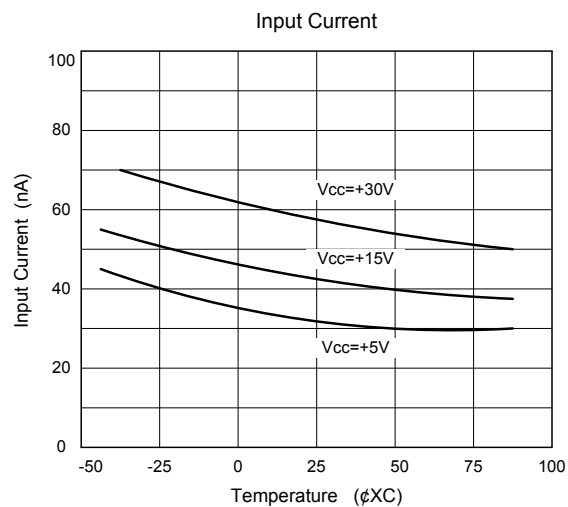
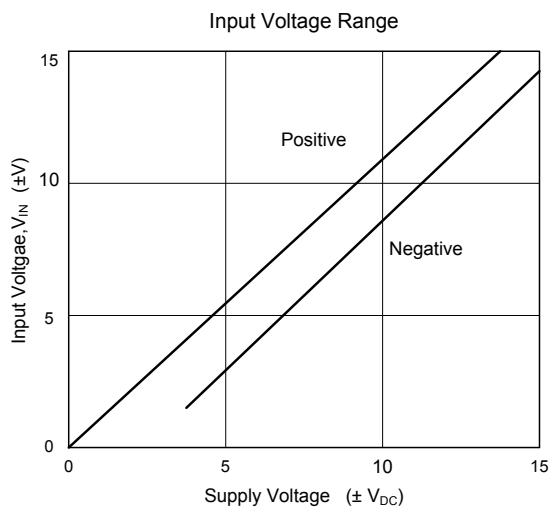
Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS

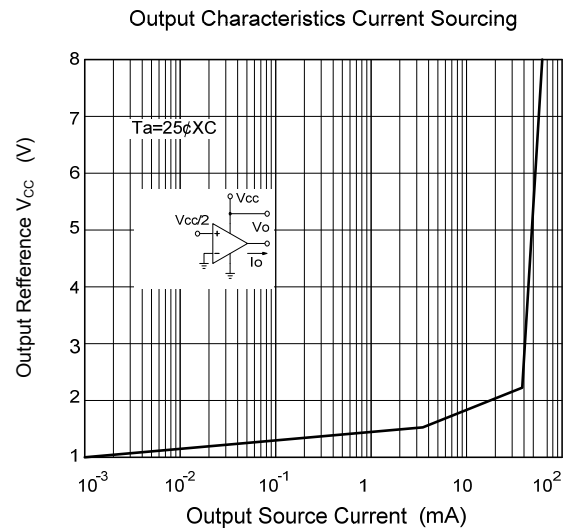
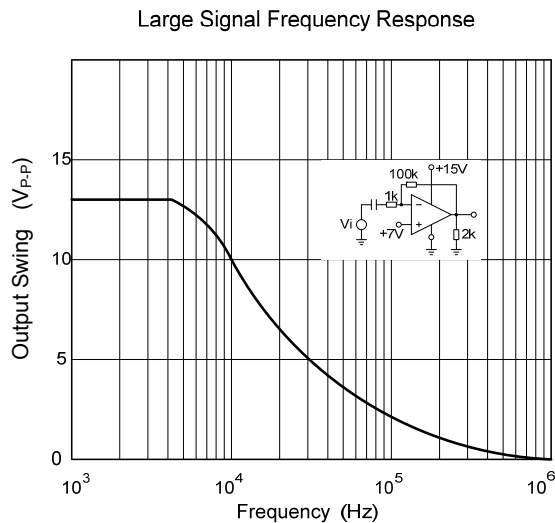
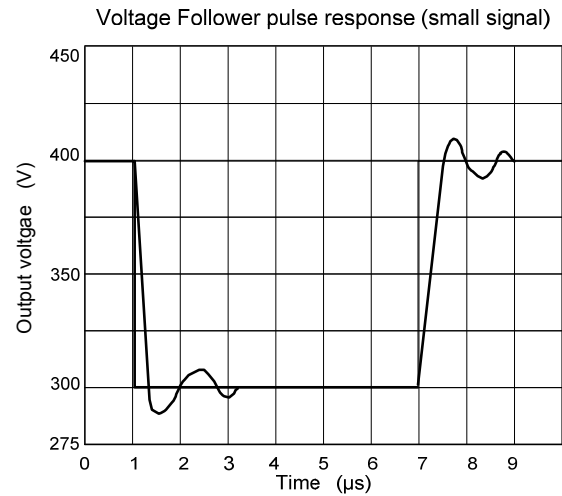
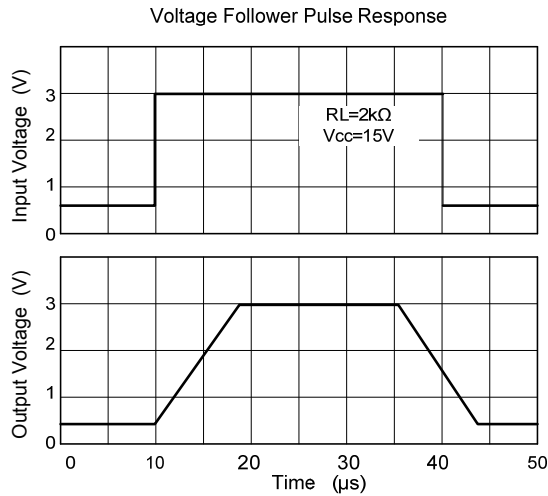
($V_{CC}=5.0\text{V}$, All voltage referenced to GND unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	$V_{I(OFF)}$	$V_{CM}=0\text{V to } V_{CC}-1.5\text{V}$ $V_{O(P)}=1.4\text{V}$, $R_S=0\Omega$			5.0	mV
Input Offset Current	$I_{I(OFF)}$				50	nA
Input Bias Current	$I_{I(BIAS)}$				250	nA
Input Common Mode Voltage	$V_{I(CM)}$	$V_{CC}=30\text{V}$	0	$V_{CC}-1.5$		V
Power Supply Current	I_{CC}	$R_L=\infty$, $V_{CC}=30\text{V}$		1.0	3.0	mA
		$V_{CC}=5\text{V}$		0.7	1.2	mA
Large Signal Voltage Gain	G_V	$V_{CC}=15\text{V}$, $R_L \geq 2\text{K}\Omega$ $V_{O(P)}=1\text{V} \sim 11\text{V}$	25	100		V/mV
Output Voltage Swing	$V_{O(H)}$	$V_{CC}=30\text{V}$, $R_L=2\text{K}\Omega$	26			V
		$V_{CC}=30\text{V}$, $R_L=10\text{K}\Omega$	27	28		V
	$V_{O(L)}$	$V_{CC}=5\text{V}$, $R_L > 10\text{K}\Omega$		5	20	mV
Common Mode Rejection Ratio	CMRR		65	75		dB
Power Supply Rejection Ratio	PSRR		65	100		dB
Channel Separation	CS	$f=1\text{KHZ} \sim 20\text{KHZ}$		120		dB
Short Circuit Current to Ground	I_{SC}			40	60	mA
Output Current	I_{SOURCE}	$V_{I(+)}=1\text{V}$, $V_{I(-)}=0\text{V}$ $V_{CC}=15\text{V}$, $V_{O(P)}=2\text{V}$	20	40		mA
	I_{SINK}	$V_{I(+)}=0\text{V}$, $V_{I(-)}=1\text{V}$ $V_{CC}=15\text{V}$, $V_{O(P)}=2\text{V}$	10	13		mA
		$V_{I(+)}=0\text{V}$, $V_{I(-)}=1\text{V}$ $V_{CC}=15\text{V}$, $V_{O(P)}=200\text{mV}$	12	45		μA
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}	V

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(cont.)



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