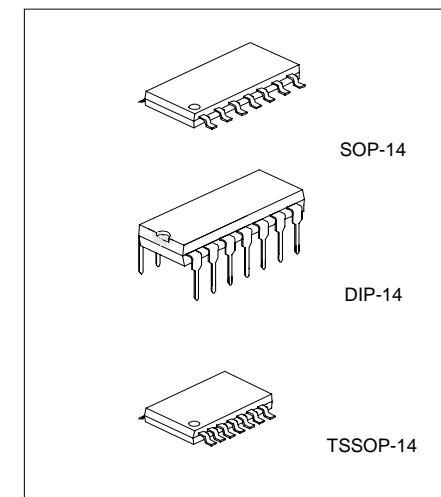


LM324***LINEAR INTEGRATED CIRCUIT*****QUAD OPERATIONAL
AMPLIFIERS****■ DESCRIPTION**

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 ($V_{cc}=3V\sim 32V$).
- *Input common-mode voltage includes ground.
- *Large output voltage swing: From 0V to $V_{cc}-1.5V$.
- *Power drain suitable for battery operation.

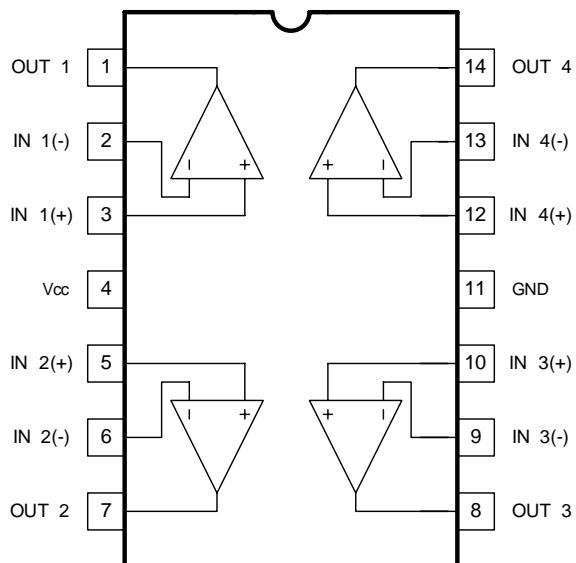


*Pb-free plating product number: LM324L

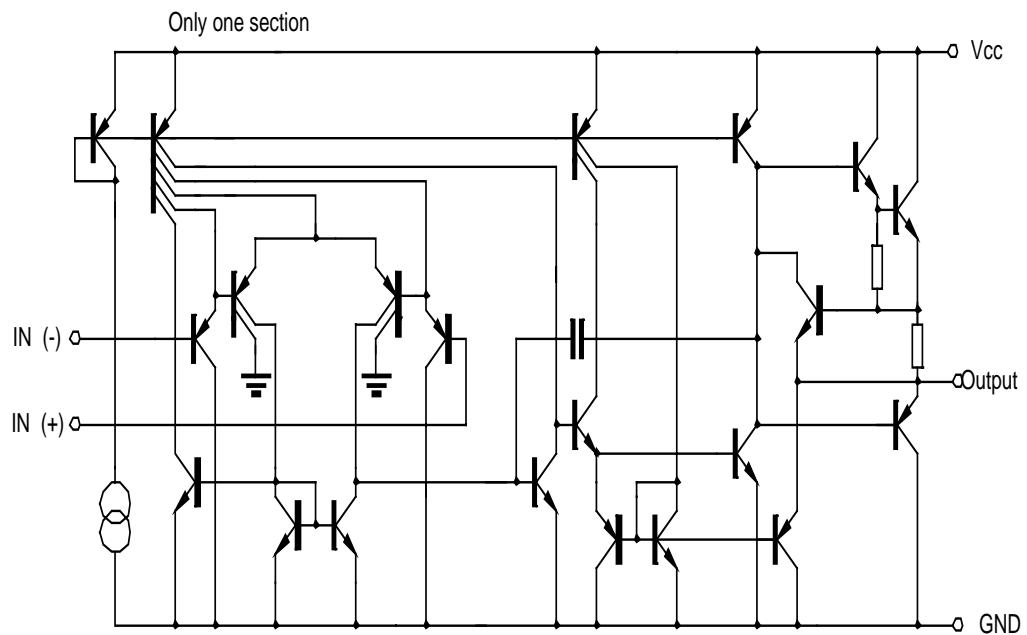
■ ORDERING INFORMATION

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

■ 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 |

■ 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 to V _{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

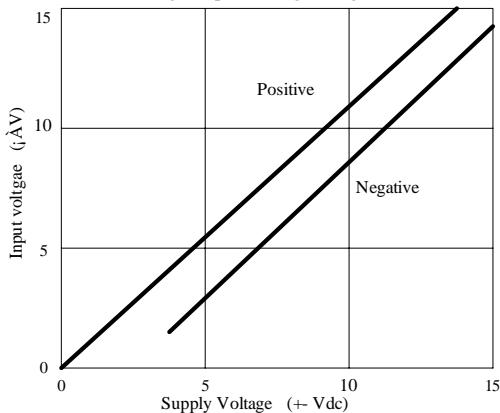


Fig.2 Input Current

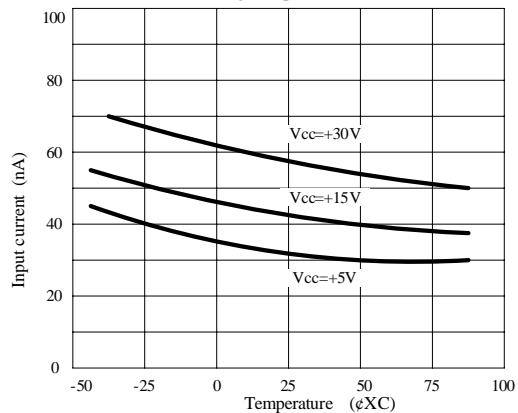


Fig.3 Supply Current

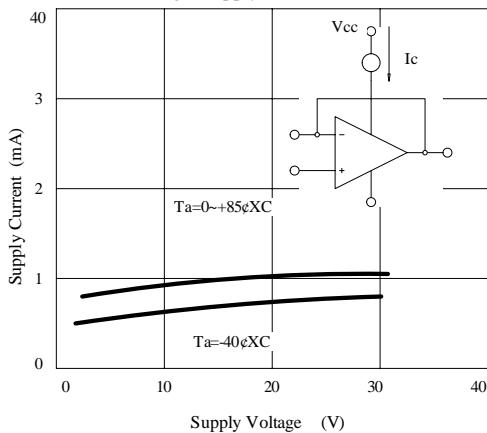


Fig.4 Voltage Gain

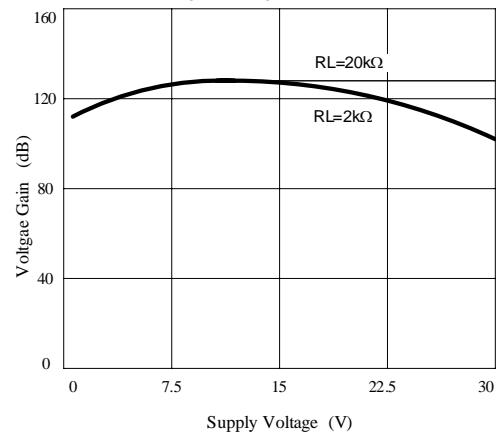


Fig.5 Open Loop Frequency response

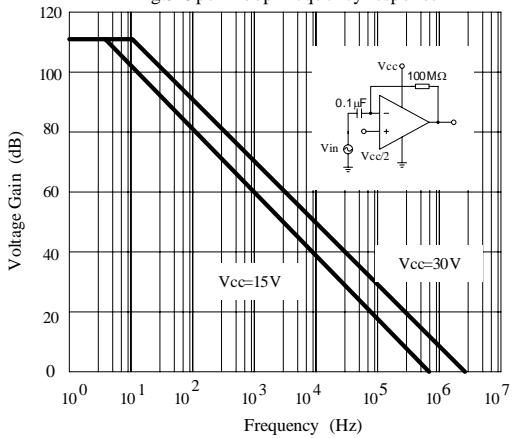
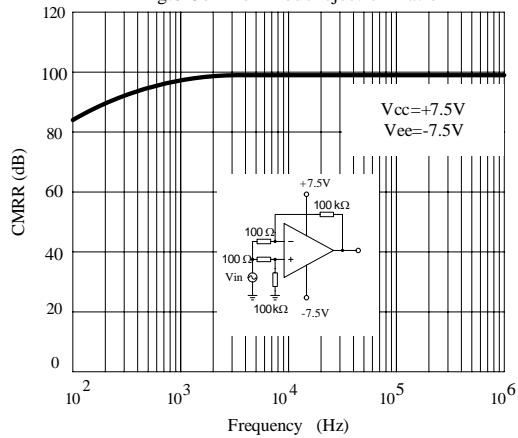


Fig.6 Common-mode rejection Ratio



■ TYPICAL CHARACTERISTICS(cont.)

Fig.7

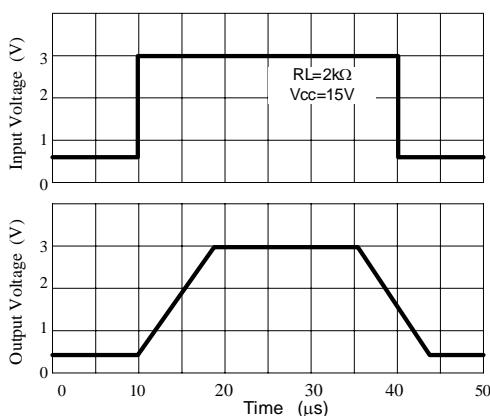


Fig.9 Large signal Frequency Response

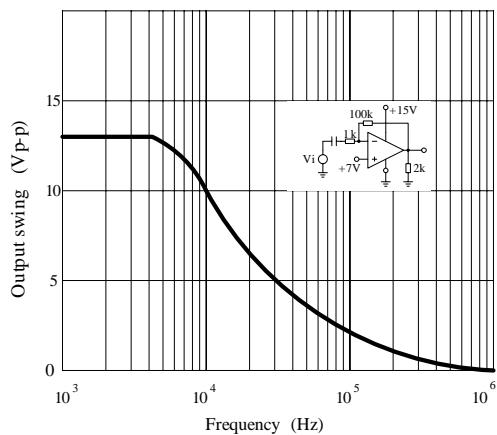


Fig.11 Output Characteristics Current sinking

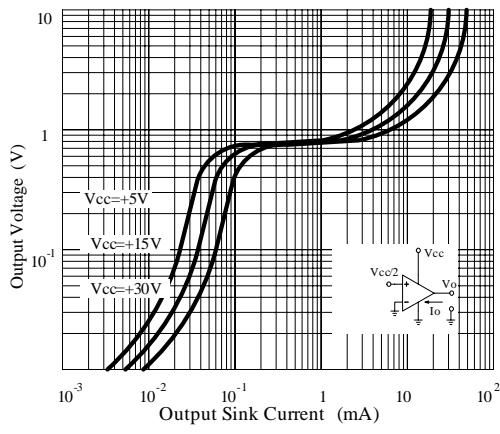


Fig.8 Voltage Follower pulse response (small signal)

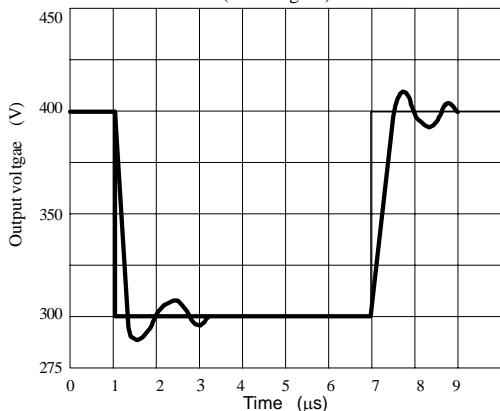


Fig.10 Output Characteristics current sourcing

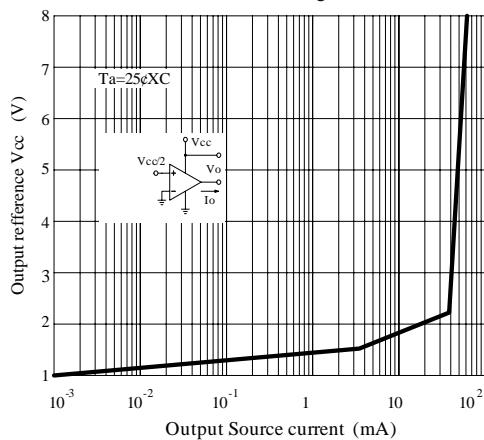
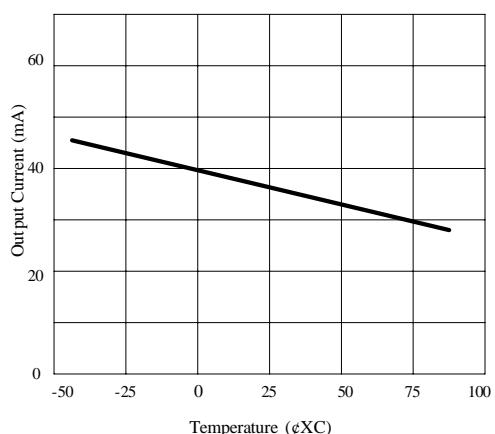


Fig.12 Current Limiting



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