

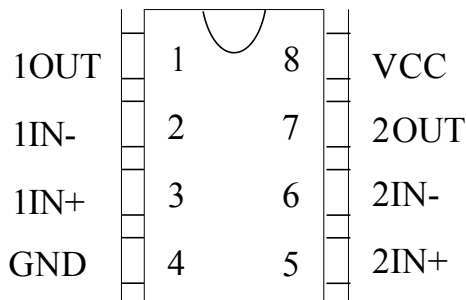
Low Power Dual Operational Amplifier

Overview

The LM358 consists of two independent high gain operational amplifiers. It can work with a single power supply or with a dual power supply, and the power consumption current of the power supply has nothing to do with the power supply voltage. Applications include audio amplifiers, industrial controls, DC gain sections and all conventional op amp circuits.

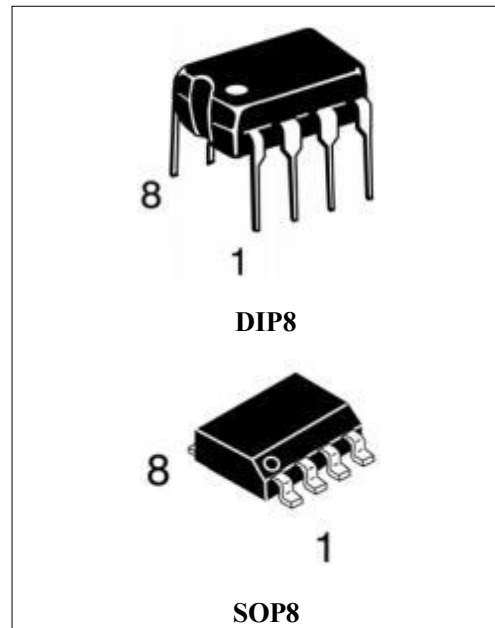
Available in DIP8 or SOP8 packages.

Pin out

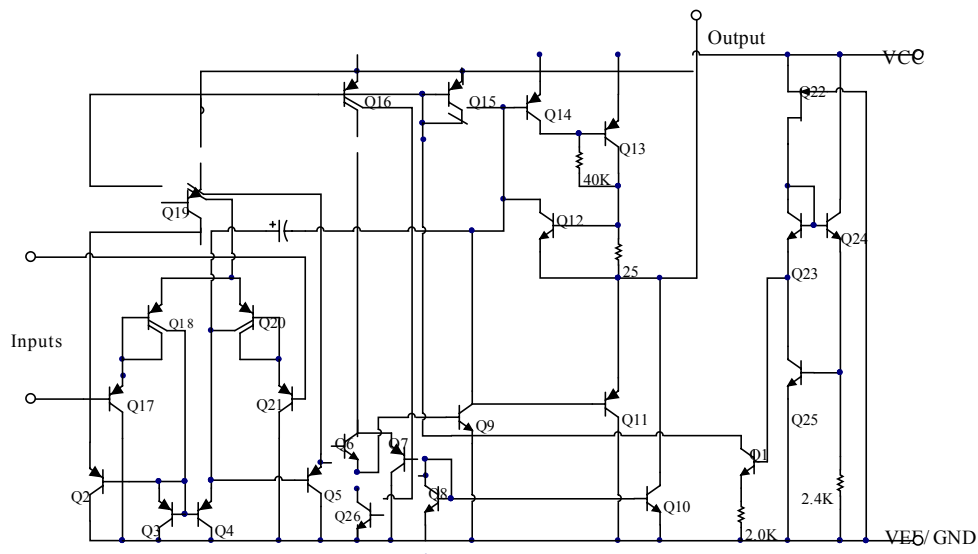


Main features

- Can work with single or dual power supply
- Contains two op amps
- logic circuit matching
- Low power consumption
- Wide frequency range



Functional block diagram (each op amp)



Limits (Absolute Maximum Ratings, if not otherwise specified, $T_{amb}=25^{\circ}\text{C}$)

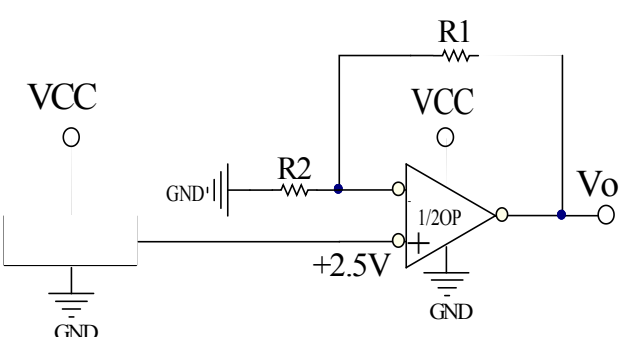
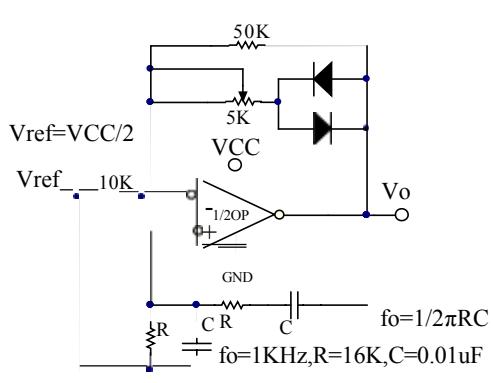
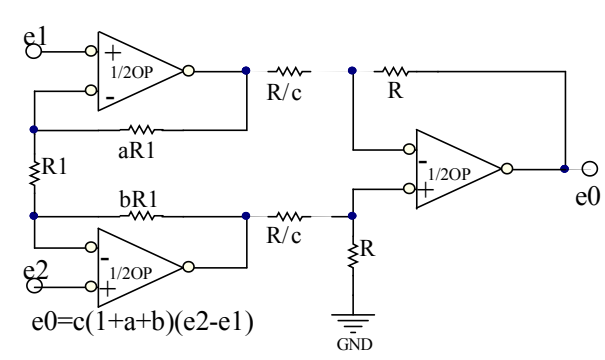
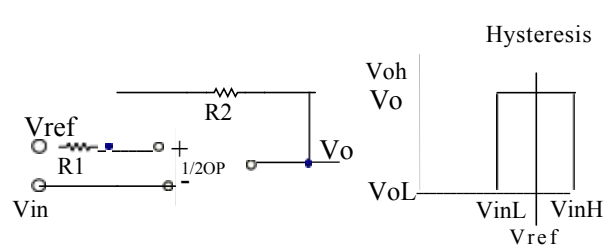
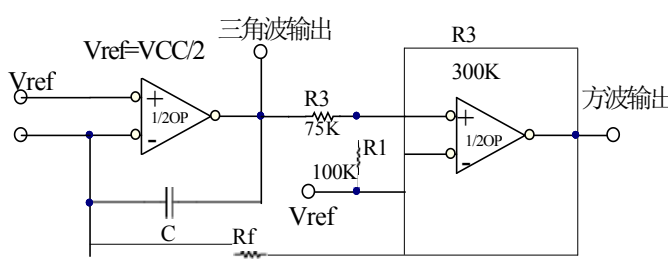
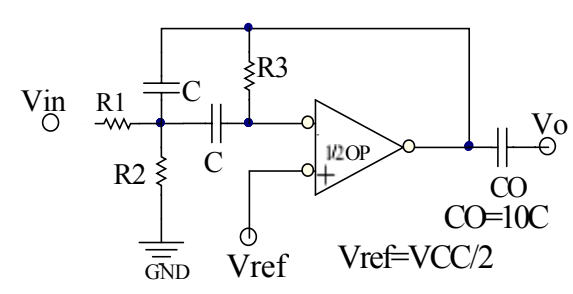
| Parameter name | | Value | Unit |
|--|-------------|--------------------|--------------------|
| Voltage | | 32 or ± 16 | V |
| Differential input voltage | | 32 | V |
| Input voltage | | $-0.3 \sim V_{CC}$ | V |
| Power consumption (Note 1) | DIP package | 830 | mW |
| | SOP package | 530 | |
| Output short-circuit current to ground (each amplifier) ($V \leq 15\text{V}$, $T_a=25^{\circ}\text{C}$) | | Last | |
| Input current ($V_{IN} < -0.3\text{V}$) | | 50 | mA |
| Maximum Operating Junction Temperature | | 150 | $^{\circ}\text{C}$ |
| Working temperature | | $0 \sim 70$ | $^{\circ}\text{C}$ |
| Storage temperature | | $-65 \sim 150$ | $^{\circ}\text{C}$ |

Note 1: The maximum junction temperature cannot be exceeded.

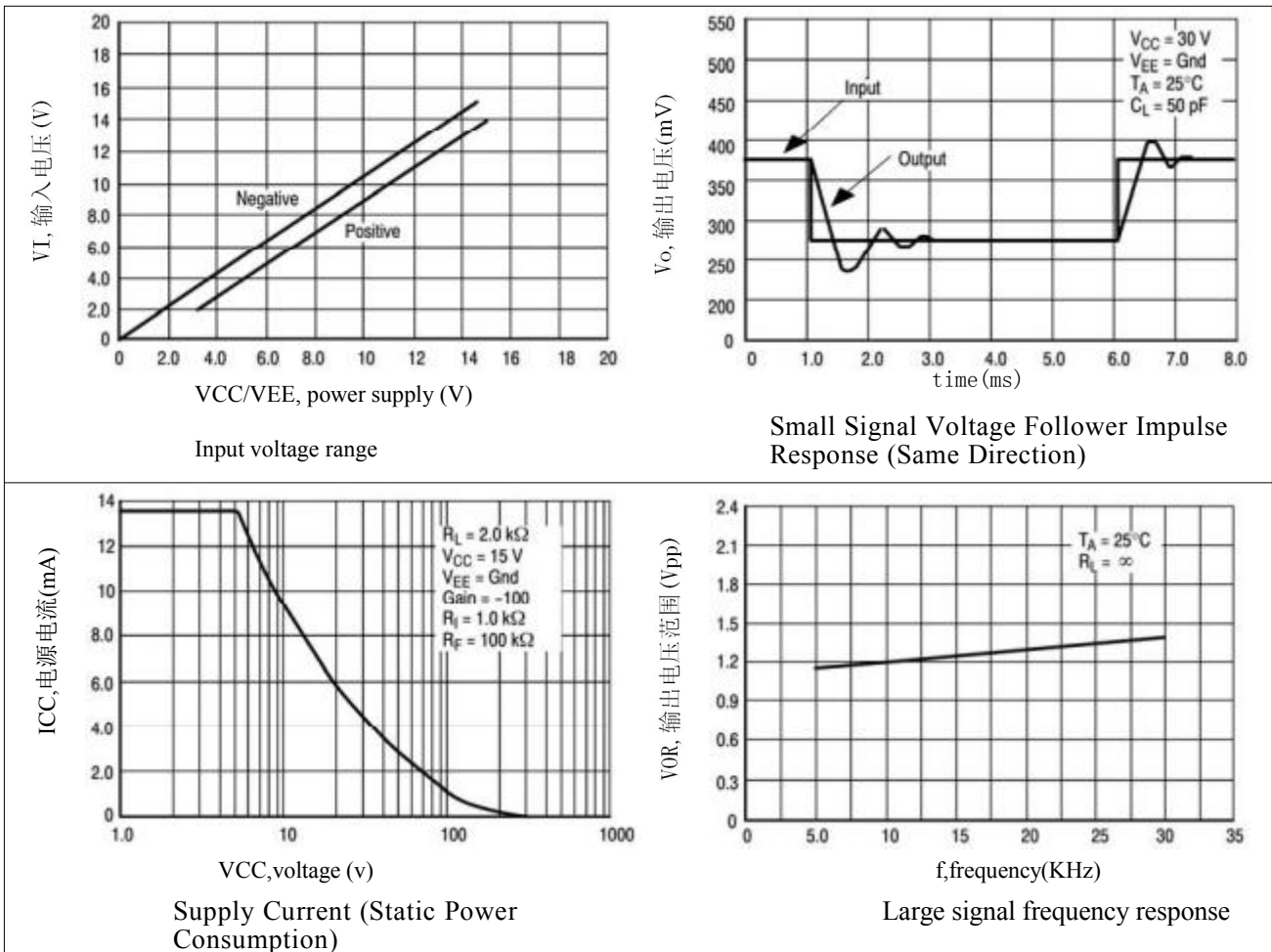
Electrical Characteristics ($V_{CC}=5.0\text{V}$ unless otherwise specified)

| Electrical parameters | Test Conditions | Canonical value | | | Unit |
|---------------------------------|---|---|------------------------|--------------------|---------------|
| | | Min | Typical | Max | |
| Input offset voltage | $T_a=25^{\circ}\text{C}$ | | ± 2 | ± 5 | mV |
| Input bias current | $T_a=25^{\circ}\text{C}$, $I_{IN(+)}$ 或 $I_{IN(-)}$, $V_{CM}=0\text{V}$ | | ± 45 | ± 250 | nA |
| Input offset current | $T_a=25^{\circ}\text{C}$, $I_{IN(+)} - I_{IN(-)}$, $V_{CM}=0\text{V}$ | | ± 3 | ± 50 | nA |
| Input common mode voltage range | $T_a=25^{\circ}\text{C}$, $V^+=30\text{V}$ | 0 | | V_{CC} -1.5 | V |
| supply current | $R_L=\infty$ on all op amps | $V_{CC}=30\text{V}$ | 1 | 2 | mA |
| | | $V_{CC}=5\text{V}$ | 0.5 | 1.2 | mA |
| Large signal voltage gain | $V_{CC}=15\text{V}$, $T_a=25^{\circ}\text{C}$, $R_L \geq 2\text{k}\Omega$ (对于 $V_o=1\sim 11\text{V}$) | 25 | 100 | | V/mV |
| Common Mode Rejection Ratio | DC, $T_a=25^{\circ}\text{C}$, $V_{CM}=0\sim V_{CC}-1.5\text{V}$ | 65 | 90 | | dB |
| power supply rejection ratio | DC, $T_a=25^{\circ}\text{C}$, $V_{CC}=5\sim 30\text{V}$ | 65 | 100 | | dB |
| Output source current | $V_{IN(+)}=1\text{V}$, $V_{IN(-)}=0\text{V}$, $V_{CC}=15\text{V}$, $V_o=2\text{V}$, $T_a=25^{\circ}\text{C}$ | 20 | 40 | | mA |
| Output current sink | $V_{IN(-)}=1\text{V}$, $V_{IN(+)}=0\text{V}$, $V_{CC}=15\text{V}$, $V_o=2\text{V}$, $T_a=25^{\circ}\text{C}$ | 10 | 15 | | mA |
| | $V_{IN(-)}=1\text{V}$, $V_{IN(+)}=0\text{V}$, $V_{CC}=15\text{V}$, $V_o=200\text{mV}$, $T_a=25^{\circ}\text{C}$ | 12 | 50 | | μA |
| Short-circuit current to ground | $V_{CC}=15\text{V}$, $T_a=25^{\circ}\text{C}$ | | 40 | 60 | mA |
| Output voltage swing | VOH | $V_{CC}=30\text{V}$ | $R_L=2\text{k}\Omega$ | 26 | V |
| | | $V_{CC}=30\text{V}$ | $R_L=10\text{k}\Omega$ | 27 | 28 |
| | VOL | $V_{CC}=5\text{V}$, $R_L=10\text{k}\Omega$ | | 5 | 20 |

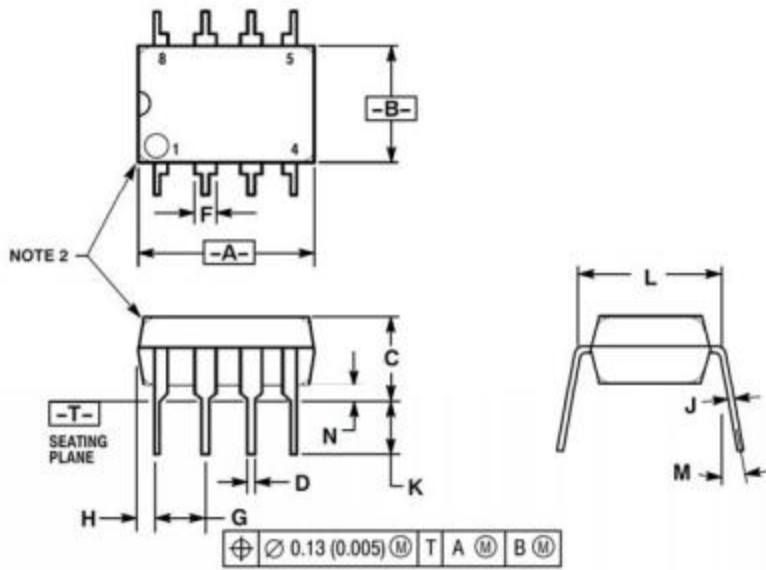
Typical application

| | |
|--|---|
|  <p>Voltage reference, $V_o = 2.5V(1 + R1/R2)$</p> |  <p>Wien Bridge Oscillator</p> |
|  <p>High Impedance Difference Amplifier</p> |  <p>Hysteresis</p> <p>$V_{inL} = (R1/(R1+R2)) * (V_{oL} - V_{ref}) + V_{ref}$ $V_{inH} = (R1/(R1+R2)) * (V_{oH} - V_{ref}) + V_{ref}$ $H = (R1/(R1+R2)) * (V_{oH} - V_{oL})$</p> <p>Hysteretic Comparator</p> |
|  <p>Function Signal Generator</p> |  <p>$f_o = \text{center frequency multiple feedback bandpass filter}$</p> |

Typical characteristic curve



Package information

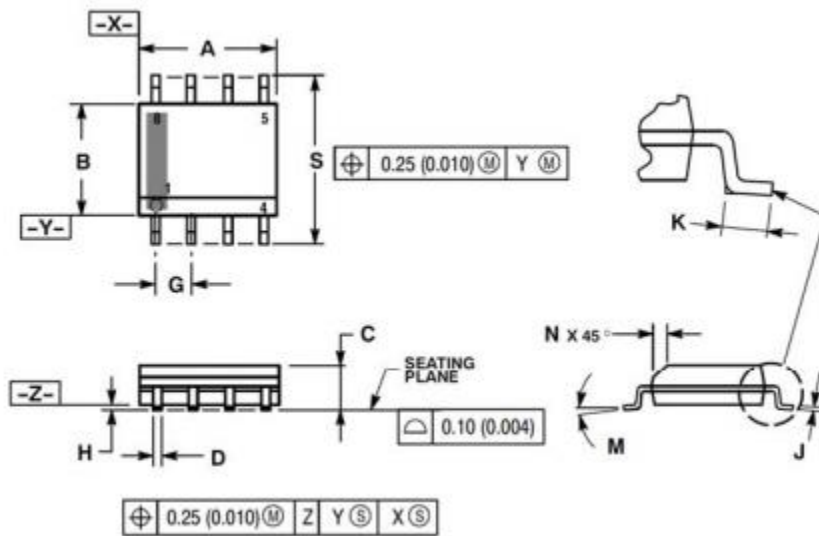


NOTES:

1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 9.40 | 10.16 | 0.370 | 0.400 |
| B | 6.10 | 6.60 | 0.240 | 0.260 |
| C | 3.94 | 4.45 | 0.155 | 0.175 |
| D | 0.38 | 0.51 | 0.015 | 0.020 |
| F | 1.02 | 1.78 | 0.040 | 0.070 |
| G | 2.54 BSC | | 0.100 BSC | |
| H | 0.76 | 1.27 | 0.030 | 0.050 |
| J | 0.20 | 0.30 | 0.008 | 0.012 |
| K | 2.92 | 3.43 | 0.115 | 0.135 |
| L | 7.62 BSC | | 0.300 BSC | |
| M | --- | 10° | --- | 10° |
| N | 0.76 | 1.01 | 0.030 | 0.040 |

DIP8



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.80 | 5.00 | 0.189 | 0.197 |
| B | 3.80 | 4.00 | 0.150 | 0.157 |
| C | 1.35 | 1.75 | 0.053 | 0.069 |
| D | 0.33 | 0.51 | 0.013 | 0.020 |
| G | 1.27 BSC | | 0.050 BSC | |
| H | 0.10 | 0.25 | 0.004 | 0.010 |
| J | 0.19 | 0.25 | 0.007 | 0.010 |
| K | 0.40 | 1.27 | 0.016 | 0.050 |
| M | 0° - 8° | | 0° - 8° | |
| N | 0.25 | 0.50 | 0.010 | 0.020 |
| S | 5.80 | 6.20 | 0.228 | 0.244 |

SOP8