



LM358

LINEAR INTEGRATED CIRCUIT

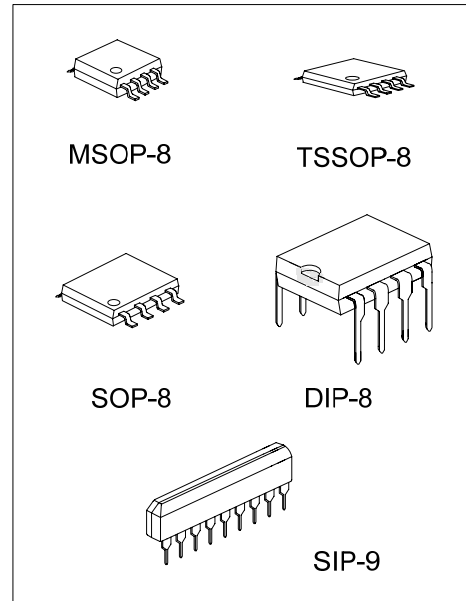
DUAL OPERATIONAL AMPLIFIER

DESCRIPTION

The UTC LM358 consists of two independent high gain, internally frequency compensated operational amplifier. It can be operated from a single power supply and also split power supplies.

FEATURES

- *Internally frequency compensated for unity gain.
- *Wide power supply range 3V - 32V.
- *Input common-mode voltage range include ground.
- *Large DC voltage gain.



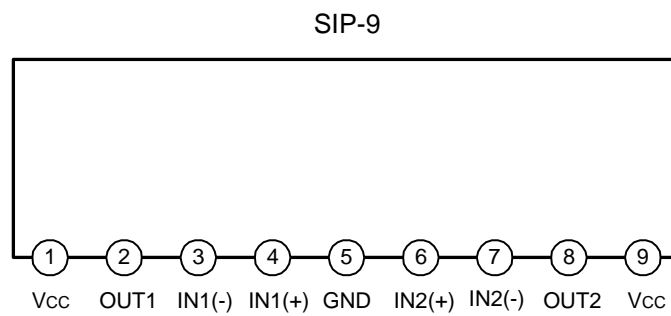
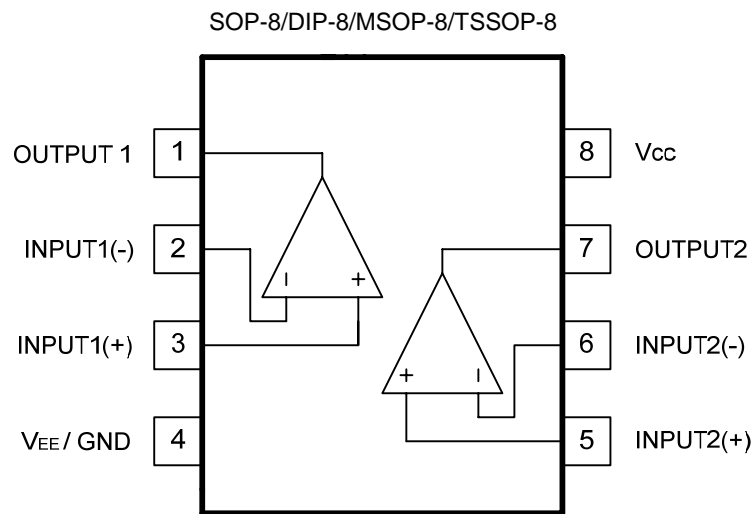
*Pb-free plating product number: LM358L

ORDERING INFORMATION

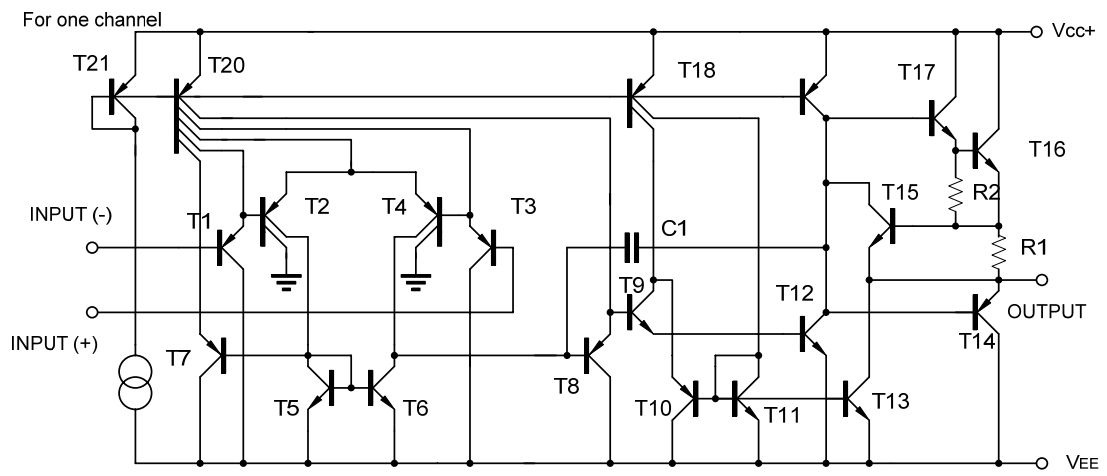
| Ordering Number | | Package | Packing |
|-----------------|-------------------|---------|-----------|
| Normal | Lead Free Plating | | |
| LM358-D08-T | LM358L-D08-T | DIP-8 | Tube |
| LM358-G09-T | LM358L-G09-T | SIP-9 | Tube |
| LM358-P08-R | LM358L-P08-R | TSSOP-8 | Tape Reel |
| LM358-P08-T | LM358L-P08-T | TSSOP-8 | Tube |
| LM358-S08-R | LM358L-S08-R | SOP-8 | Tape Reel |
| LM358-S08-T | LM358L-S08-T | SOP-8 | Tube |
| LM358-SM1-R | LM358L-SM1-R | MSOP-8 | Tape Reel |
| LM358-SM1-T | LM358L-SM1-T | MSOP-8 | Tube |

| | |
|---|---|
| <p>LM358L-D08-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Plating</p> | <p>(1) R: Tape Reel, T: Tube (2) D08: DIP-8, G09: SIP-9, S08: SOP-8, SM1: MSOP-8, P08: TSSOP-8 (3) L: Lead Free Plating, Blank: Pb/Sn</p> |
|---|---|

■ PIN DESCRIPTION



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

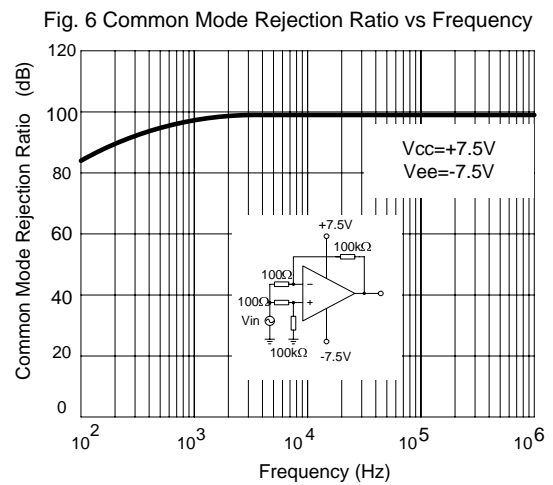
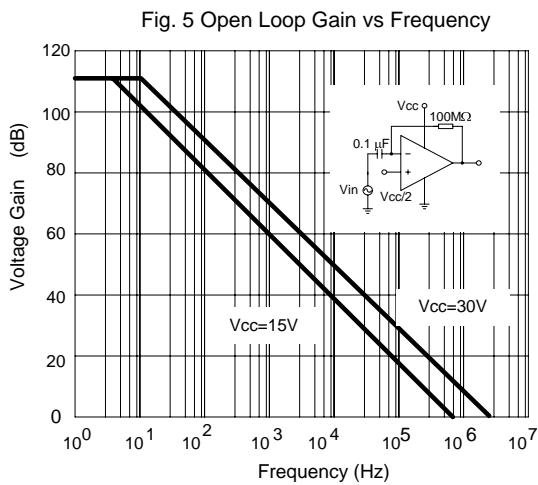
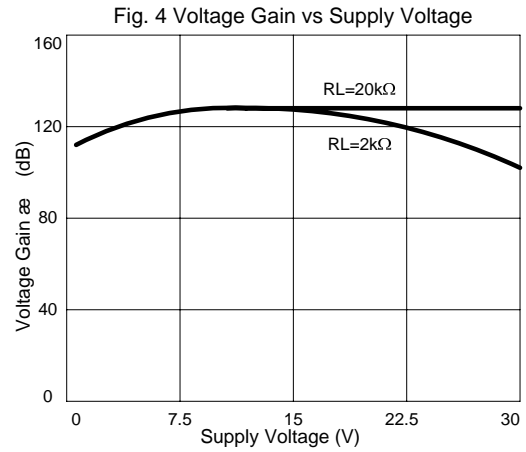
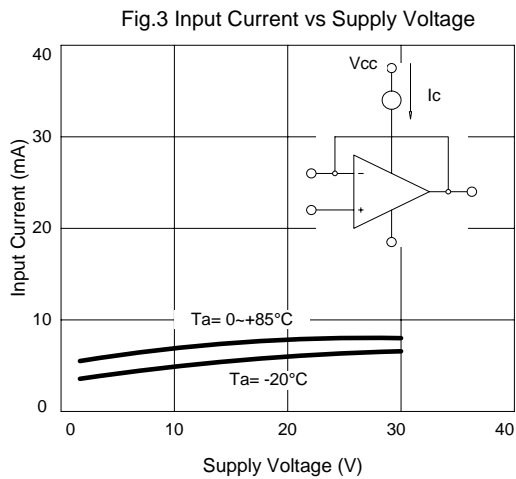
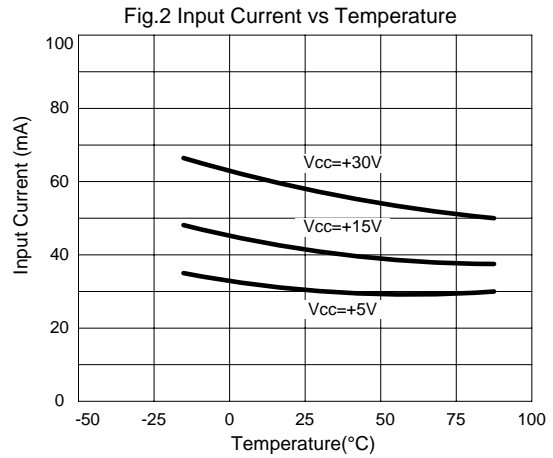
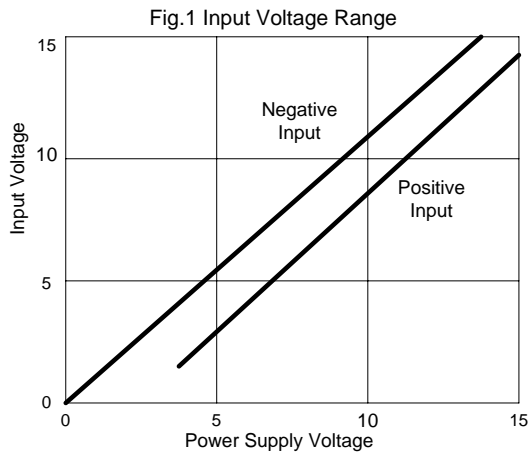
| PARAMETER | | SYMBOL | RATINGS | UNIT |
|----------------------------|----------------|---------------|----------------|--------------------|
| Supply Voltage | | V_{CC} | ± 16 or 32 | V |
| Differential Input Voltage | | $V_{I(DIFF)}$ | ± 32 | V |
| Input Voltage | | V_I | -0.3 ~ +32 | V |
| Output Short to Ground | | | Continuous | |
| Power Dissipation | SIP-9 | P_D | 600 | mW |
| | DIP-8 | | 500 | |
| | SOP-8 | | 280 | |
| | TSSOP-8/MSOP-8 | | 200 | |
| Junction Temperature | | T_J | +125 | $^{\circ}\text{C}$ |
| Operating Temperature | | T_{OPR} | 0 ~ +70 | $^{\circ}\text{C}$ |
| Storage Temperature | | T_{STG} | -65 ~ +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 ($V_{CC}=5.0\text{V}$, $V_{EE}=\text{GND}$, $T_a=25^{\circ}\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------------------------|---------------|--|-----|-----|--------------|------|
| Input Offset Voltage | $V_{I(OFF)}$ | $V_{CM}=0\text{V}$ to $V_{CC}-1.5\text{V}$ $V_{O(P)}=1.4\text{V}$, $R_S=0\Omega$ | | 2.9 | 7.0 | mV |
| Input Common Mode Voltage | $V_{I(CM)}$ | $V_{CC}=30\text{V}$ | 0 | | $V_{CC}-1.5$ | V |
| Differential Input Voltage | $V_{I(DIFF)}$ | | | | V_{CC} | V |
| Output Voltage Swing | V_{OH} | $V_{CC}=30\text{V}$, $R_L=2\text{K}\Omega$ | 26 | | | V |
| | | $V_{CC}=30\text{V}$, $R_L=10\text{K}\Omega$ | 27 | 28 | | V |
| | V_{OL} | $V_{CC}=5\text{V}$, $R_L \geq 10\text{K}\Omega$ | | 5 | 20 | mV |
| 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 |
| Power Supply Current | I_{CC} | $R_L=\infty$, $V_{CC}=30\text{V}$ | | 0.8 | 2.0 | mA |
| | | $R_L=\infty$, Full Temperature Range | | 0.5 | 1.2 | mA |
| Input Offset Current | $I_{I(OFF)}$ | | | 5 | 50 | nA |
| Input Bias Current | $I_{I(BIAS)}$ | | | 45 | 250 | nA |
| Short Circuit Current to Ground | I_{SC} | | | 40 | 60 | mA |
| Output Current | I_{SOURCE} | $V_I(+)=1\text{V}$, $V_I(-)=0\text{V}$ $V_{CC}=15\text{V}$, $V_{O(P)}=2\text{V}$ | 10 | 30 | | mA |
| | | $V_I(+)=0\text{V}$, $V_I(-)=1\text{V}$ $V_{CC}=15\text{V}$, $V_{O(P)}=2\text{V}$ | 10 | 15 | | mA |
| | I_{SINK} | $V_I(+)=0\text{V}$, $V_I(-)=1\text{V}$ $V_{CC}=15\text{V}$, $V_{O(P)}=200\text{mV}$ | 12 | 100 | | mA |
| Common Mode Rejection Ratio | CMRR | | 65 | 80 | | dB |
| Power Supply Rejection Ratio | PSRR | | 65 | 100 | | dB |
| Channel Separation | CS | $f=1\text{KHZ} \sim 20\text{KHZ}$ | | 120 | | dB |

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS(Cont.)

Fig. 7 Voltage Follower Pulse Response

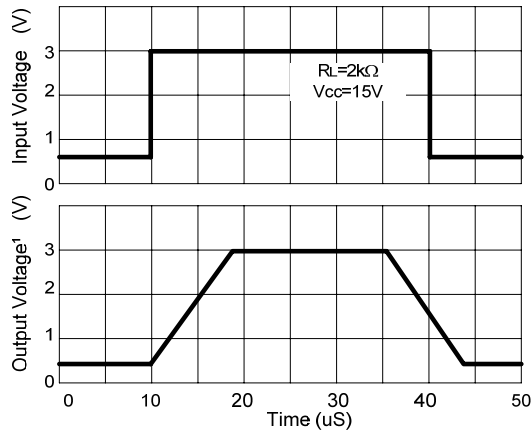


Fig. 8 Voltage Follower Response (Small Signal)

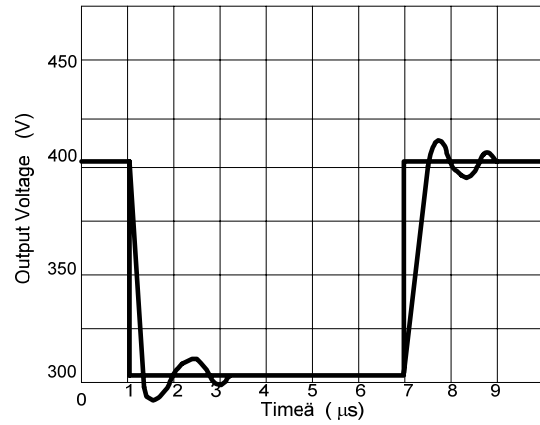


Fig. 9 Gain vs Large Signal Frequency

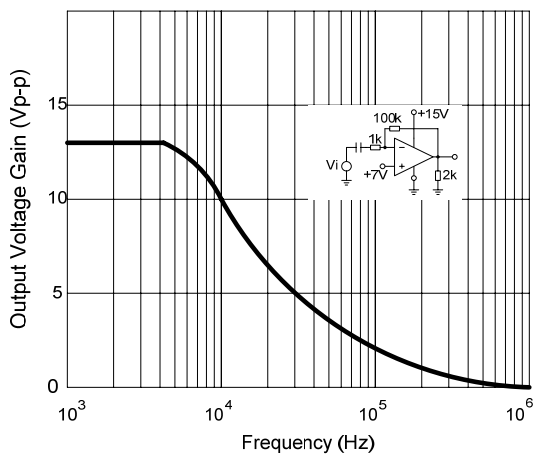


Fig. 10 Output Current Sinking vs Output Voltage

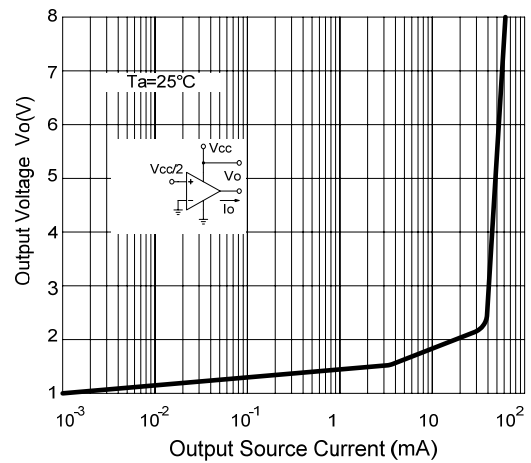


Fig. 11 Output Sink Current vs Output Voltage

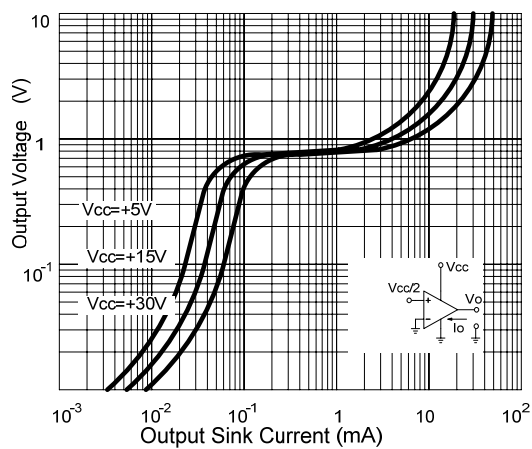
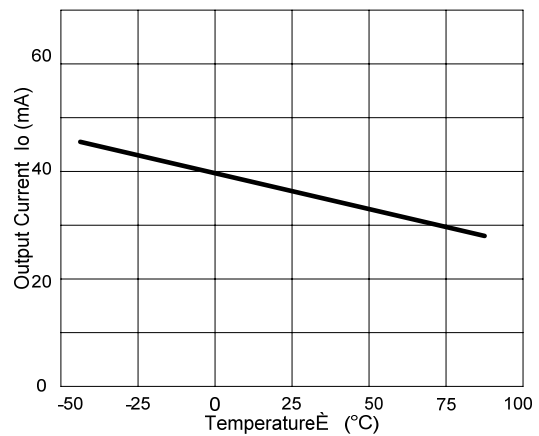


Fig.12 Current Limiting vs Temperature



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