

## Dual JFET Input Precision High Speed Op Amp

### FEATURES

- 13V/ $\mu$ s Slew Rate 8V/ $\mu$ s Min.
- 5MHz Gain-Bandwidth Product
- Fast Settling Time 1.3 $\mu$ s to 0.02%
- 300 $\mu$ V Offset Voltage (LT1057)
- 5 $\mu$ V/ $^{\circ}$ C  $V_{OS}$  Drift
- 60pA Bias Current at 70 $^{\circ}$ C
- Low Voltage Noise 13nV/ $\sqrt{\text{Hz}}$  at 1kHz  
26nV/ $\sqrt{\text{Hz}}$  at 10Hz

### APPLICATIONS

- Precision, High Speed Instrumentation
- Fast, Precision Sample and Hold
- Logarithmic Amplifiers
- D/A Output Amplifiers
- Photodiode Amplifiers
- Voltage to Frequency Converters
- Frequency to Voltage Converters

### DESCRIPTION

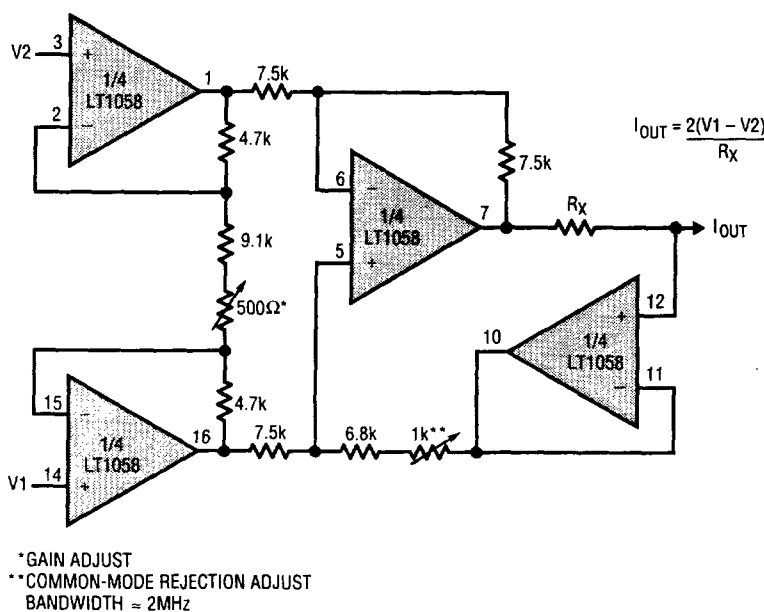
The LT1057 is a matched JFET input dual op amp featuring a combination of outstanding high speed and precision specifications. It replaces all the popular bipolar and JFET input dual op amps. In particular, the LT1057 upgrades the performance of systems using the LF412A and OP-215 JFET input duals.

The LT1058 is the lowest offset quad JFET input operational amplifier. It offers significant accuracy improvement over presently available JFET input quad operational amplifiers. It can replace four single precision JFET input op amps, while saving board space, power dissipation and cost.

For the first time, precision dual and quad JFET op amps are available in a surface mounted package. For extended operating temperatures ( $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ ) the LT1057IS and LT1058IS are offered.

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Current Output, High Speed, High Input Impedance Instrumentation Amplifier



# LT1057S/LT1057IS LT1058S/LT1058IS

## ABSOLUTE MAXIMUM RATINGS

|                                             |                                                |
|---------------------------------------------|------------------------------------------------|
| Supply Voltage .....                        | $\pm 20\text{V}$                               |
| Differential Input Voltage .....            | $\pm 40\text{V}$                               |
| Input Voltage .....                         | $\pm 20\text{V}$                               |
| Output Short Circuit Duration .....         | Indefinite                                     |
| Operating Temperature Range                 |                                                |
| LT1057S, LT1058S .....                      | $0^{\circ}\text{C}$ to $70^{\circ}\text{C}$    |
| LT1057IS, LT1058IS .....                    | $-40^{\circ}\text{C}$ to $85^{\circ}\text{C}$  |
| Storage Temperature Range                   |                                                |
| All Devices .....                           | $-65^{\circ}\text{C}$ to $150^{\circ}\text{C}$ |
| Lead Temperature (Soldering, 10 sec.) ..... | $300^{\circ}\text{C}$                          |

## PACKAGE/ORDER INFORMATION

|                                                          |                     |
|----------------------------------------------------------|---------------------|
| <p>TOP VIEW</p> <p>S PACKAGE<br/>16-LEAD PLASTIC SOL</p> | ORDER PART NUMBER   |
|                                                          | LT1057S<br>LT1057IS |
| <p>TOP VIEW</p> <p>S PACKAGE<br/>16-LEAD PLASTIC SOL</p> | LT1058S<br>LT1058IS |

## ELECTRICAL CHARACTERISTICS $V_S = \pm 15\text{V}$ , $T_A = 25^{\circ}\text{C}$ , $V_{CM} = 0\text{V}$ unless otherwise noted.

| SYMBOL    | PARAMETER                                        | CONDITIONS                                                                       | MIN        | TYP                | MAX       | UNITS                        |
|-----------|--------------------------------------------------|----------------------------------------------------------------------------------|------------|--------------------|-----------|------------------------------|
| $V_{OS}$  | Input Offset Voltage                             | LT1057<br>LT1058                                                                 |            | 0.3<br>0.35        | 2<br>2.5  | mV                           |
| $I_{OS}$  | Input Offset Current                             | Fully Warmed Up                                                                  |            | 5                  | 50        | pA                           |
| $I_B$     | Input Bias Current                               | Fully Warmed Up                                                                  |            | $\pm 10$           | $\pm 100$ | pA                           |
|           | Input Resistance – Differential<br>– Common-Mode | $V_{CM} = -11\text{V}$ to $+8\text{V}$<br>$V_{CM} = +8\text{V}$ to $+11\text{V}$ |            | 0.4<br>0.4<br>0.05 |           | $\text{T}\Omega$             |
|           | Input Capacitance                                |                                                                                  |            | 4                  |           | pF                           |
| $e_n$     | Input Noise Voltage                              | $0.1\text{Hz}$ to $10\text{Hz}$<br>LT1057<br>LT1058                              |            | 2.1<br>2.5         |           | $\mu\text{Vp-p}$             |
| $e_n$     | Input Noise Voltage Density                      | $f_0 = 10\text{Hz}$<br>$f_0 = 1\text{kHz}$                                       |            | 26<br>13           |           | $\text{nV}/\sqrt{\text{Hz}}$ |
| $i_n$     | Input Noise Current Density                      | $f_0 = 10\text{Hz}, 1\text{kHz}$                                                 |            | 1.8                |           | $\text{fA}/\sqrt{\text{Hz}}$ |
| $A_{VOL}$ | Large Signal Voltage Gain                        | $V_O = \pm 10\text{V}$<br>$R_L = 2\text{k}$<br>$R_L = 1\text{k}$                 | 100<br>50  | 300<br>220         |           | V/mV                         |
|           | Input Voltage Range                              |                                                                                  | $\pm 10.5$ | 14.3<br>$-11.5$    |           | V                            |

**ELECTRICAL CHARACTERISTICS**  $V_S = \pm 15V$ ,  $T_A = 25^\circ C$ ,  $V_{CM} = 0V$  unless otherwise noted.

| SYMBOL    | PARAMETER                    | CONDITIONS                            | MIN      | TYP      | MAX | UNITS      |
|-----------|------------------------------|---------------------------------------|----------|----------|-----|------------|
| CMRR      | Common-Mode Rejection Ratio  | $V_{CM} = \pm 10.5V$ LT1057<br>LT1058 | 82<br>80 | 98<br>98 |     | dB         |
| PSRR      | Power Supply Rejection Ratio | $V_S = \pm 10V$ to $\pm 18V$          | 86       | 102      |     | dB         |
| $V_{OUT}$ | Output Voltage Swing         | $R_L = 2k$                            | $\pm 12$ | $\pm 13$ |     | V          |
| SR        | Slew Rate                    |                                       | 8        | 13       |     | V/ $\mu s$ |
| GBW       | Gain-Bandwidth Product       | $f = 1MHz$ (Note 1)                   | 3        | 5        |     | MHz        |
| $I_S$     | Supply Current Per Amplifier |                                       |          | 1.7      | 2.8 | mA         |
|           | Channel Separation           | DC to 5kHz, $V_{IN} = \pm 10V$        |          | 130      |     | dB         |

**ELECTRICAL CHARACTERISTICS**  $V_S = \pm 15V$ ,  $V_{CM} = 0V$ ,  $0^\circ C \leq T_A \leq 70^\circ C$ , (LT1057S, LT1058S) or  $-40^\circ C \leq T_A \leq 85^\circ C$ , (LT1057IS, LT1058IS), unless otherwise noted.

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| SYMBOL    | PARAMETER                                               | CONDITIONS                                                     | MIN      | TYP                   | MAX                    | UNITS            |
|-----------|---------------------------------------------------------|----------------------------------------------------------------|----------|-----------------------|------------------------|------------------|
| $V_{OS}$  | Input Offset Voltage                                    | LT1057 •<br>LT1058S •<br>LT1058IS •                            |          | 0.5<br>0.6<br>0.7     | 2.5<br>3.0<br>4.0      | mV               |
|           | Average Temperature Coefficient of Input Offset Voltage | •                                                              |          | 5                     |                        | $\mu V/^\circ C$ |
| $I_{OS}$  | Input Offset Current                                    | Warmed Up, $T_A = 70^\circ C$<br>Warmed Up, $T_A = 85^\circ C$ |          | 20<br>35              | 250<br>400             | pA               |
| $I_B$     | Input Bias Current                                      | Warmed Up, $T_A = 70^\circ C$<br>Warmed Up, $T_A = 85^\circ C$ |          | $\pm 60$<br>$\pm 100$ | $\pm 400$<br>$\pm 700$ | pA               |
| $A_{VOL}$ | Large Signal Voltage Gain                               | $V_O = \pm 10V$ , $R_L = 2k$ LT1057 •<br>LT1058 •              | 50<br>40 | 200<br>200            |                        | V/mV             |
| CMRR      | Common-Mode Rejection Ratio                             | $V_{CM} = \pm 10.5V$ LT1057 •<br>LT1058 •                      | 80<br>78 | 96<br>96              |                        | dB               |
| PSRR      | Power Supply Rejection Ratio                            | $V_S = \pm 10V$ to $\pm 18V$ LT1057 •<br>LT1058 •              | 84<br>82 | 100<br>100            |                        | dB               |
| $V_{OUT}$ | Output Voltage Swing                                    | $R_L = 2k$ •                                                   | $\pm 12$ | $\pm 12.8$            |                        | V                |

The • denotes the specifications which apply over the full operating temperature range.

**Note 1:** Gain bandwidth product is not tested. It is guaranteed by design and by inference from the slew rate measurement.