

DESCRIPTION

The RH1056A JFET input operational amplifiers combine precision specifications with high speed performance.

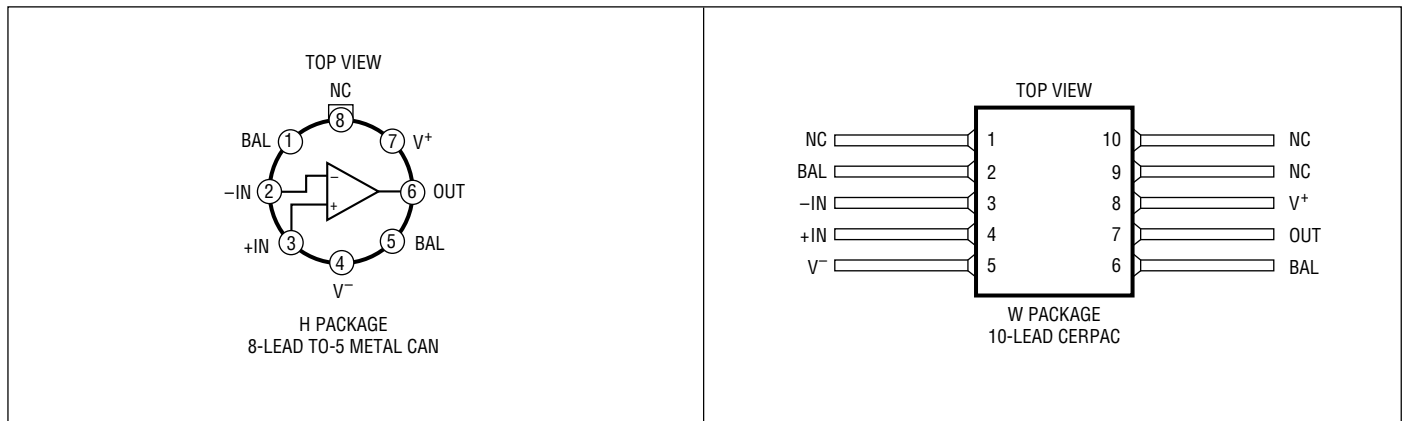
For the first time, 16V/ μ s slew rate and 6.5MHz gain-bandwidth product are simultaneously achieved with off-set voltage of typically 50 μ V, 1.2 μ V/ $^{\circ}$ C drift, bias currents of 40pA at 70 $^{\circ}$ C.

The wafer lots are processed to LTC's in-house Class S flow to yield circuits usable in stringent military applications.

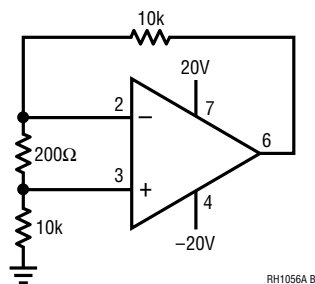
ABSOLUTE MAXIMUM RATINGS

| | |
|--------------------------------------------|------------------------------------|
| Supply Voltage | ± 20 V |
| Differential Input Voltage | ± 40 V |
| Input Voltage | ± 20 V |
| Output Short-Circuit Duration | Indefinite |
| Operating Temperature Range | -55° C to 125° C |
| Storage Temperature Range | -65° C to 150° C |
| Lead Temperature (Soldering, 10 sec) | 300° C |

PACKAGE/ORDER INFORMATION



BURN-IN CIRCUIT



RH1056A BI

TOTAL DOSE BIAS CIRCUIT

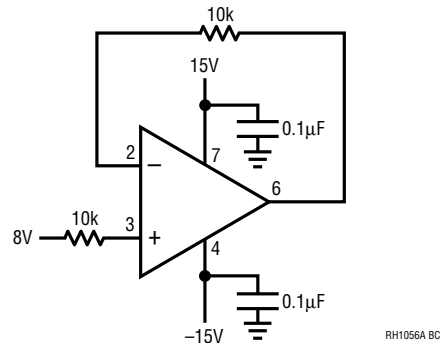


TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation) (Note 2)

| SYMBOL | PARAMETER | CONDITIONS | NOTES | $T_A = 25^\circ\text{C}$ | | | SUB-GROUP | $-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ | | | SUB-GROUP | UNITS |
|-----------|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------|-----|------------|-----------|-----------------------------------------------------|-----|----------|-----------|--------------------------------------------------------------|
| | | | | MIN | TYP | MAX | | MIN | TYP | MAX | | |
| V_{OS} | Input Offset Voltage | | 1 | | | 300 | 4 | | | 700 | 2, 3 | μV |
| I_{OS} | Input Offset Current | Fully Warmed Up $T_A = 125^\circ\text{C}$ | 3 3 | | | 10 | 1 | | | 1.5 | 2 | μA nA |
| I_B | Input Bias Current | Fully Warmed Up $T_A = 125^\circ\text{C}$ | 3 | | | 50 | 1 | | | 3.0 | 2 | μA nA |
| R_{IN} | Input Resistance | | | | | 10^{12} | | | | | | Ω |
| A_{VOL} | Large-Signal Voltage Gain | $V_S = \pm 15\text{V}$, $V_O = \pm 10\text{V}$, $R_L = 2\text{k}$ $V_S = \pm 15\text{V}$, $V_O = \pm 10\text{V}$, $R_L = 1\text{k}$ | | 150 130 | | | 4 4 | | | 40 | 5,6 | V/mV V/mV |
| V_O | Output Voltage Swing | $V_S = \pm 15\text{V}$, $R_L = 2\text{k}$ | | ± 12 | | | 4 | | | ± 12 | 5,6 | V |
| V_{CM} | Input Common Mode Voltage Range | $V_S = \pm 15\text{V}$ | | ± 11 | | | 1 | | | ± 11 | 2,3 | V |
| CMRR | Common Mode Rejection Ratio | $V_{CM} = \pm 11\text{V}$ $V_{CM} = \pm 10.5\text{V}$ | | 86 | | | 1 | | | 85 | 2,3 | dB dB |
| PSRR | Power Supply Rejection Ratio | $V_S = \pm 10\text{V}$ to $\pm 18\text{V}$ $V_S = \pm 10\text{V}$ to $\pm 17\text{V}$ | | 90 | | | 1 | | | 88 | 2,3 | dB dB |
| I_S | Supply Current | $V_S = \pm 15\text{V}$ | | | | 6.5 | 1 | | | | | mA |
| SR | Slew Rate | $A_V = 1$, $V_S = \pm 15\text{V}$ | | 12 | | | 7 | | | | | $\text{V}/\mu\text{s}$ |
| GBW | Gain-Bandwidth Product | $V_S = \pm 15\text{V}$ | | | | 6.5 | | | | | | MHz |
| e_n | Input Noise Voltage Density | $V_S = \pm 15\text{V}$, $f = 10\text{Hz}$ $V_S = \pm 15\text{V}$, $f = 1\text{kHz}$ | | | | 28 14 | | | | | | $\text{nV}/\sqrt{\text{Hz}}$ $\text{nV}/\sqrt{\text{Hz}}$ |
| i_n | Input Noise Current Density | $V_S = \pm 15\text{V}$, $f = 10\text{Hz}$ $V_S = \pm 15\text{V}$, $f = 1\text{kHz}$ | | | | 1.8 1.8 | | | | | | $\text{fA}/\sqrt{\text{Hz}}$ $\text{fA}/\sqrt{\text{Hz}}$ |
| C_{IN} | Input Capacitance | | | | | 4 | | | | 4 | | pF |

TABLE 1A: ELECTRICAL CHARACTERISTICS (Postirradiation) (Note 4)

| SYMBOL | PARAMETER | CONDITIONS | NOTES | 10KRAD(Si) | | 25KRAD(Si) | | 50KRAD(Si) | | 100KRAD(Si) | | 200KRAD(Si) | | UNITS |
|-----------|---------------------------------|--------------------------------------------------------------|-------|------------|----------|------------|-----------|------------|-----------|-------------|------------|-------------|------------|--------------|
| | | | | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| V_{OS} | Input Offset Voltage | | 1 | | 300 | | 300 | | 370 | | 570 | | 570 | μ V |
| I_{OS} | Input Offset Current | | 3 | | ± 10 | | ± 50 | | ± 150 | | ± 250 | | ± 350 | pA |
| I_B | Input Bias Current | | 3 | | ± 50 | | ± 250 | | ± 500 | | ± 1000 | | ± 2000 | pA |
| A_{VOL} | Large-Signal Voltage Gain | $V_O = \pm 10V, R_L \geq 2k$ $V_O = \pm 10V, R_L \geq 1k$ | | 150 130 | | 150 130 | | 150 130 | | 100 87 | | 75 65 | | V/mV V/mV |
| V_O | Output Voltage Swing | $R_L \geq 2k$ | | ± 12 | | ± 12 | | ± 12 | | ± 12 | | ± 12 | | V |
| V_{CM} | Input Common Mode Voltage Range | $V_S = \pm 15V$ | | ± 11 | | ± 11 | | ± 11 | | ± 11 | | ± 11 | | V |
| CMRR | Common Mode Rejection Ratio | $V_{CM} = \pm 11V$ | | 86 | | 86 | | 86 | | 86 | | 86 | | dB |
| PSRR | Power Supply Rejection Ratio | $V_S = \pm 10V$ to $\pm 18V$ | | 90 | | 90 | | 90 | | 90 | | 90 | | dB |
| I_S | Supply Current | | | | 7 | | 7 | | 7 | | 7 | | 7 | mA |
| SR | Slew Rate | $A_V = 1, V_S = \pm 15V$ | | 12 | | 12 | | 12 | | 12 | | 12 | | V/ μ s |
| C_{IN} | Input Capacitance | | | 3(Typ) | | 3(Typ) | | 3(Typ) | | 3(Typ) | | 3(Typ) | | pF |

Note 1: Unless otherwise specified, the absolute maximum negative input voltage is equal to the negative power supply voltage. Offset voltage is measured under two different conditions: (a) approximately 0.5 seconds after application of power, (b) at $T_A = 25^\circ\text{C}$ only, with the chip heated to approximately 45°C to account for chip temperature rise when the device is fully warmed up.

Note 2: Unless otherwise stated, $V_S = \pm 15V$; and V_{OS} , I_B and I_{OS} are measured at $V_{CM} = 0V$.

Note 3: The input bias currents are junction leakage currents which approximately double for every 10°C increase in the junction temperature, T_J . Due to limited production test time, the input bias currents measured are correlated to junction temperature. In normal operation the junction temperature rises above the ambient temperature as a result of internal power dissipation, P_D . $T_J = T_A + (\theta_{JA} \cdot P_D)$ where θ_{JA} is the thermal resistance from junction to ambient.

Note 4: Unless otherwise stated, $V_S = \pm 15V$, $V_{CM} = 0V$ and $T_A = 25^\circ\text{C}$.

TABLE 2: ELECTRICAL TEST REQUIREMENTS

| MIL-STD-883 TEST REQUIREMENTS | SUBGROUP |
|--------------------------------------------------------------------------------------------------------------|----------------|
| Final Electrical Test Requirements (Method 5004) | 1*,2,3,4,5,6,7 |
| Group A Test Requirements (Method 5005) | 1,2,3,4,5,6,7 |
| Group B and D for Class S, and Class C and D for Class B End Point Electrical Parameters (Method 5005) | 1 |

* PDA applies to subgroup 1. See PDA Test Notes.

PDA Test Notes

The PDA is specified as 5% based on failures from group A, subgroup 1, tests after cooldown as the final electrical test in accordance with method 5004 of MIL-STD-883. The verified failures of group A, subgroup 1, after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent for the lot.

Linear Technology Corporation reserves the right to test to tighter limits than those given.

TYPICAL PERFORMANCE CHARACTERISTICS

