

## NTE887M Integrated Circuit Low Power, JFET OP Amplifier

**Description:**

The NTE887M is a JFET-input operational amplifier in an 8-Lead DIP type package designed as a low-power version of the NTE857M amplifier. This device features high input impedance, wide bandwidth, high slew rate, and low input offset and bias current.

**Features:**

- Very Low Power Consumption
- Typical Supply Current: 200 $\mu$ A
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Common-Mode Input Voltage Range Includes  $V_{CC+}$
- Output Short-Circuit Protection
- High Input Impedance: JFET-Input Stage
- Internal Frequency Compensation
- Latch-Up-Free Operation
- High Slew rate: 3.5V/ $\mu$ s Typ

**Absolute Maximum Ratings:** ( $T_A = 0^\circ$  to  $+70^\circ\text{C}$  unless otherwise specified)

|   |                                     |
|---|-------------------------------------|
| Supply Voltage (Note 1), $V_{CC+}$ .....  | +18V                                |
| Supply Voltage (Note 1), $V_{CC-}$ .....  | -18V                                |
| Differential Input Voltage (Note 2), $V_{ID}$ .....                                 | $\pm 30\text{V}$                    |
| Input Voltage (Note 1, Note 3), $V_I$ .....   | $\pm 15\text{V}$                    |
| Duration of Output Short Circuit (Note 4), $t_s$ .....                              | Unlimited                           |
| Continuous Total Dissipation, $P_D$   |                                     |
| $T_A \leq +25^\circ\text{C}$ .....  | 680mW                               |
| Derate Above $+65^\circ\text{C}$ .....  | 8mW/ $^\circ\text{C}$               |
| $T_A = +70^\circ\text{C}$ .....   | 640mW                               |
| Operating Ambient Temperature Range, $T_A$ .....                                    | $0^\circ$ to $+70^\circ\text{C}$    |
| Storage Temperature range, $T_{stg}$ .....  | $-65^\circ$ to $+150^\circ\text{C}$ |
| Lead Temperature (During Soldering, 1/16" (1.6mm) from case for 10sec), $T_L$ ..... | $+260^\circ\text{C}$                |

- Note 1. All voltage values, except differential voltages, are with respect to the midpoint between  $V_{CC+}$  and  $V_{CC-}$ .
- Note 2. Differential voltages are at the non-inverting input pin with respect to the inverting input pin.
- Note 3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15V, whichever is less.
- Note 4. The output may be shorted to GND or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

**Electrical Characteristics:** ( $V_{CC\pm} = \pm 15V$ , Note 5 unless otherwise specified)

| Parameter  | Symbol          | Test Conditions  | Min                              | Typ                                      | Max | Unit             |      |
|--|-----------------|--|----------------------------------|--|-----|------------------|------|
| Input Offset Voltage   | $V_{IO}$        | $V_O = 0$ ,<br>$R_S = 50\Omega$  | $T_A = +25^\circ C$              | –  | 3   | 15               | mV   |
|  |                 |  | $T_A = 0^\circ$ to $+70^\circ C$ | –  | –   | 20               | mV   |
| Temperature Coefficient of Input Offset Voltage                        | $\alpha_{VIO}$  | $V_O = 0$ , $R_S = 50\Omega$ , $T_A = 0^\circ$ to $+70^\circ C$                        | –                                | 10                                       | –   | $\mu V/^\circ C$ |      |
| Input Offset Current   | $I_{IO}$        | $V_O = 0$ , Note 6   | $T_A = +25^\circ C$              | –  | 5   | 200              | pA   |
|  |                 |  | $T_A = 0^\circ$ to $+70^\circ C$ | –  | –   | 5                | nA   |
| Input Bias Current   | $I_{IB}$        | $V_O = 0$ , Note 6   | $T_A = +25^\circ C$              | –  | 30  | 400              | pA   |
|  |                 |  | $T_A = 0^\circ$ to $+70^\circ C$ | –  | –   | 10               | nA   |
| Common-Mode Input Voltage Range  | $V_{ICR}$       | $T_A = +25^\circ C$  | $\pm 11$                         | $\begin{matrix} -12 \\ +15 \end{matrix}$ | –   | V                |      |
| Maximim Peak Output Voltage Swing                                      | $V_{OM}$        | $R_L = 10k\Omega$ , $T_A = +25^\circ C$  | $\pm 10.0$                       | $\pm 13.5$                               | –   | V                |      |
|  |                 | $R_L \geq 10k\Omega$ , $T_A = 0^\circ$ to $+70^\circ C$                                | $\pm 10.0$                       | –  | –   | V                |      |
| Large-Signal Differential Voltage Amplification                        | $A_{VD}$        | $V_O = \pm 10V$ ,<br>$R_L \geq 10k\Omega$  | $T_A = +25^\circ C$              | 3  | 6   | –                | V/mV |
|  |                 |  | $T_A = 0^\circ$ to $+70^\circ C$ | 3  | –   | –                | V/mV |
| Unity-Gain Bandwidth   | $B_1$           | $R_L = 10k\Omega$ , $T_A = +25^\circ C$  | –                                | 1  | –   | MHz              |      |
| Input Resistance   | $r_i$           | $T_A = +25^\circ C$  | –                                | $10^{12}$                                | –   | $\Omega$         |      |
| Common-Mode Rejection Ratio  | CMRR            | $V_{IC} = V_{ICRmin}$ , $V_O = 0$ , $R_S = 50\Omega$ ,<br>$T_A = +25^\circ C$          | 70                               | 86                                       | –   | dB               |      |
| Supply Volatge Rejection Ratio<br>( $\Delta V_{CC\pm}/\Delta V_{IO}$ ) | $k_{SVR}$       | $V_{CC} = \pm 15V$ to $\pm 9V$ , $V_O = 0$ ,<br>$R_S = 50\Omega$ , $T_A = +25^\circ C$ | 70                               | 95                                       | –   | dB               |      |
| Total Power Dissipation  | $P_D$           | No Load, $V_O = 0$ , $T_A = +25^\circ C$   | –                                | 6.0                                      | 7.5 | mW               |      |
| Supply Current   | $I_{CC}$        | No Load, $V_O = 0$ , $T_A = +25^\circ C$   | –                                | 200                                      | 250 | $\mu A$          |      |
| Crosstalk Attenuation  | $V_{O1}/V_{O2}$ | $A_{VD} = 100$ , $T_A = +25^\circ C$   | –                                | 120                                      | –   | dB               |      |

Note 5. All characteristics are measured under open-loop conditions with zero common-mode voltage unless otherwise specified.

Note 6. Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive. Pulse techniques must be used that will maintain the junction temperature as close to the ambient temperature as possible.

**Operating Characteristics:** ( $V_{CC\pm} = \pm 15V$ ,  $T_A = +25^\circ C$  unless otherwise specified)

| Parameter                      | Symbol | Test Conditions                                  | Min | Typ | Max | Unit           |
|--------------------------------|--------|--|-----|-----|-----|----------------|
| Slew Rate at Unity Gain        | SR     | $V_I = 10V$ , $R_L = 10k\Omega$ , $C_L = 100pF$  | 1.5 | 3.5 | –   | V/ $\mu s$     |
| Rise Time                      | $t_r$  | $V_I = 20mV$ , $R_L = 10k\Omega$ , $C_L = 100pF$ | –   | 0.2 | –   | $\mu s$        |
| Overshoot Factor               |        |  | –   | 10% | –   |                |
| Equivalent Input Noise Voltage | $V_n$  | $R_S = 100\Omega$ , $f = 1kHz$                   | –   | 42  | –   | $nV/\sqrt{Hz}$ |

### Pin Connection Diagram

