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# NTE976
# Integrated Circuit
# Operational Amplifier

**Description:**

The NTE976 is a general purpose operational amplifier with the necessary frequency compensation built into a single 8–Lead DIP type package. Advanced processing techniques make the input currents a factor of ten lower than industry standards like the NTE909. Yet, it is a direct plug–in replacement for the NTE909 and the NTE941M.

This device provides better accuracy and lower noise in high impedance circuitry. The low input currents also make it particularly well suited for long interval integrators or timers, sample and hold circuits, and low frequency waveform generators. Further, replacing circuits where matched transistor pairs buffer the inputs of conventional IC op amps, the NTE976 can give lower offset voltage and drift at a lower cost.

**Features:**

- Offset Voltage over Temperature: 3mV Max
- Input Current over Temperature: 100nA Max
- Offset Current over Temperature: 20nA Max
- Guaranteed Drift Characteristics

**Absolute Maximum Ratings:**

Supply Voltage,

$V_{CC}$ . . . . . . . . . . . . . . . . . . . . +18V

$V_{EE}$ . . . . . . . . . . . . . . . . . . . . –18V

Power Dissipation (Note 1), $P_D$ . . . . . . . . . . . . 500mW

Differential Input Voltage, $V_{ID}$ . . . . . . . . . . . . ±30V

Input Voltage (Note 2), $V_{IN}$ . . . . . . . . . . . . 15V

Output Short–Circuit Duration, $t_s$ . . . . . . . . . . . . Indefinite

Operating Temperature Range, $T_A$ . . . . . . . . . . . . 0° to +70°C

Storage Temperature Range, $T_{stg}$ . . . . . . . . . . . . –65° to +150°C

Lead Temperature (During Soldering, 10sec), $T_L$ . . . . . . . . . . . . +300°C

Note 1. The maximum junction temperature of the NTE976 is +100°C. The thermal resistance junction to ambient is +100°C/W.

Note 2. For supply voltages less than –15V, the absolute maximum input voltage is equal to the supply voltage.

**Electrical Characteristics:** (0° ≤ $T_A$ ≤ +70°C, ±5V ≤ $V_S$ ≤ ±15V unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $T_A$ = +25°C, $R_S$ ≤ 50kΩ | – | 2.0 | 7.5 | mV |
| | | $R_S$ ≤ 50kΩ | – | – | 10 | mV |
| Input Offset Current | $I_{IO}$ | $T_A$ = +25°C | – | 3.0 | 50 | nA |
| | | | – | – | 70 | nA |
| Input Bias Current | $I_{IB}$ | $T_A$ = +25°C | – | 70 | 250 | nA |
| | | | – | – | 300 | nA |
| Input Resistance | $r_i$ | $T_A$ = +25°C | 0.5 | 2.0 | – | MΩ |
| Supply Current | $I_D$ | $T_A$ = +25°C, $V_S$ = ±15V | – | 1.8 | 3.0 | mA |
| Large Signal Voltage Gain | $A_v$ | $T_A$ = +25°C, $V_S$ = ±15V, $V_{OUT}$ = ±10V, $R_L$ ≥ 2kΩ | 25 | 160 | – | V/mV |
| | | $V_S$ = ±15V, $V_{OUT}$ = ±10V, $R_L$ ≥ 2kΩ | 15 | – | – | V/mV |
| Average Temperature Coefficient of Input Offset Voltage | $TCV_{IO}$ | | – | 6.0 | 30 | µV/°C |
| Average Temperature Coefficient of Input Offset Current | $TCI_{IO}$ | +25°C ≤ $T_A$ ≤ +70°C | – | 0.01 | 0.3 | nA/°C |
| | | 0°C ≤ $T_A$ ≤ +25°C | – | 0.02 | 0.6 | nA/°C |
| Output Voltage Swing | $V_O$ | $V_S$ = ±15V, $R_L$ = 10kΩ | ±12 | ±14 | – | V |
| | | $V_S$ = ±15V, $R_L$ = 2kΩ | ±10 | ±13 | – | V |
| Input Voltage Range | $V_{ICR}$ | $V_S$ = ±15V | ±12 | +15 –13 | – | V |
| Common Mode Rejection Ratio | CMRR | $R_S$ ≤ 50kΩ | 70 | 90 | – | dB |
| Supply Voltage Rejection Ratio | PSRR | $R_S$ ≤ 50kΩ | 70 | 96 | – | dB |

**Pin Connection Diagram**