



ELECTRONICS, INC.
 44 FARRAND STREET
 BLOOMFIELD, NJ 07003
 (973) 748-5089

NTE906 Integrated Circuit Dual, High Frequency, Differential Amplifier

Description:

The NTE906 is an integrated circuit in a 12-Lead TO5 type package consisting of two independent differential amplifiers with associated constant-current transistors on a common monolithic substrate. The six transistors which comprise the amplifiers are general-purpose devices which exhibit low 1/f noise and a value of f_T in excess of 1GHz. These features make the NTE906 useful from DC to 500MHz. Bias and load resistors have been omitted to provide maximum application flexibility.

The monolithic construction of the NTE906 provides close electrical and thermal matching of the amplifiers. This feature makes this device particularly useful in dual-channel applications where matched performance of the two channels is required.

Features:

- Power Gain: 23dB (Typ) @ 200MHz
- Noise Figure: 4.6dB (Typ) @ 200MHz
- Two Different Amplifiers on a Common Substrate
- Independently Accessible Input and Outputs

Absolute Maximum Ratings: ($T_A = +25^\circ\text{C}$ unless otherwise specified)

| | |
|--|-------------------------------------|
| Power Dissipation, P_D | |
| Any One Transistor | 300mW |
| Total Package | 600mW |
| Derate Above $+55^\circ\text{C}$ | 5mW/ $^\circ\text{C}$ |
| Operating Temperature Range, T_{opr} | -55° to $+125^\circ\text{C}$ |
| Storage Temperature Range, T_{stg} | -65° to $+150^\circ\text{C}$ |

The following ratings apply for each transistor:

| | |
|---|------|
| Collector-Emitter Voltage, V_{CEO} | 15V |
| Collector-Base Voltage, V_{CBO} | 20V |
| Collector-Substrate Voltage (Note 1), V_{C10} | 20V |
| Emitter-Base Voltage, V_{EBO} | 5V |
| Collector Current, I_C | 50mA |

Note 1. The collector of each transistor is isolated from the substrate by an integral diode. The substrate (Pin9) must be connected to the most negative point in the external circuit to maintain isolation between transistors and to provide for normal transistor action.

Electrical Characteristics: ($T_A = +25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|------------------------------|---|-----------|--------|---------------|------------------------------|------|
| Static Characteristics (For Each Differential Amplifier) | | | | | | | |
| Input Offset Voltage | V_{IO} | | – | 0.25 | – | mV | |
| Input Offset Current | I_{IO} | $I_3 = I_9 = 2\text{mA}$ | – | 0.3 | – | μA | |
| Input Bias Current | I_{IB} | | – | 13.5 | 33 | μA | |
| Temperature Coefficient Magnitude of Input–Offset Voltage | $ \Delta V_{IO} / \Delta T$ | | – | 1.1 | – | $\mu\text{V}/^\circ\text{C}$ | |
| (For Each Transistor) | | | | | | | |
| DC Forward Base–Emitter Voltage | V_{BE} | $V_{CE} = 6\text{V}, I_C = 1\text{mA}$ | – | 774 | – | mV | |
| Temperature Coefficient of Base–Emitter Voltage | $\Delta V_{BE} / \Delta T$ | $V_{CE} = 6\text{V}, I_C = 1\text{mA}$ | – | –0.9 | – | $\text{mV}/^\circ\text{C}$ | |
| Collector Cutoff Current | I_{CBO} | $V_{CB} = 10\text{V}, I_E = 0$ | – | 0.0013 | 100 | nA | |
| Collector–Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C = 1\text{mA}, I_B = 0$ | 15 | 24 | – | V | |
| Collector–Substrate Breakdown Voltage | $V_{(BR)CIO}$ | $I_C = 10\mu\text{A}, I_B = 0, I_E = 0$ | 20 | 60 | – | V | |
| Emitter–Base Breakdown Voltage | $V_{(BR)EBO}$ | $I_E = 10\mu\text{A}, I_C = 0$ | 5 | 7 | – | V | |
| Dynamic Characteristics | | | | | | | |
| 1/f Noise Figure (For Single Transistor) | NF | $f = 100\text{kHz}, R_S = 500\Omega, I_C = 1\text{mA}$ | – | 1.5 | – | dB | |
| Gain–Bandwidth Product (For Single Transistor) | f_T | $V_{CE} = 6\text{V}, I_C = 5\text{mA}$ | – | 1.38 | – | GHz | |
| Collector–Base Capacitance | C_{CB} | $I_C = 0, V_{CB} = 5\text{V}$ | Note 2 | – | 0.28 | – | pF |
| | | | Note 3 | – | 0.28 | – | pF |
| Collector–Substrate Capacitance | C_{CI} | $I_C = 0, V_{CI} = 5\text{V}$ | – | 1.65 | – | pF | |
| (For Each Differential Amplifier) | | | | | | | |
| Common–Mode Rejection Ratio | CMR | $I_3 = I_9 = 2\text{mA}$ | – | 100 | – | dB | |
| AGC Range, One Stage | AGC | Bias Voltage = -6V | – | 75 | – | dB | |
| Voltage Gain, Single–Ended Output | A | Bias Voltage = $-4.2\text{V}, f = 10\text{MHz}$ | – | 22 | – | dB | |
| Insertion Power Gain | G_P | For Diff. Amplifier Configuration $I_3 = I_9 = 4\text{mA}$ (each Collector $I_C \approx 2\text{mA}$) | Cascode | – | 23 | – | dB |
| Noise Figure | NF | | Cascode | – | 4.6 | – | dB |
| Input Admittance | Y_{11} | | Cascode | – | $1.5+j2.45$ | – | mmho |
| | | | Diff. Amp | – | $0.878+j1.3$ | – | mmho |
| Reverse Transfer Admittance | Y_{12} | | Cascode | – | $0-j0.008$ | – | mmho |
| | | | Diff. Amp | – | $0-j0.013$ | – | mmho |
| Forward Transfer Admittance | Y_{21} | | Cascode | – | $17.9-j30.7$ | – | mmho |
| | | | Diff. Amp | – | $-10.5+j13$ | – | mmho |
| Output Admittance | Y_{22} | | Cascode | – | $-0.503-j15$ | – | mmho |
| | | | Diff. Amp | – | $0.071+j0.62$ | – | mmho |

Note 2. Pins 1 & 12 or Pins 6 & 7.

Note 3. Pins 10 & 11 or Pins 4 & 5.

Pin Connection Diagram
(Top View)

