



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

NTE912 Integrated Circuit General Purpose Transistor Array (Three Isolated Transistors and One Differentially-Connected Transistor Pair)

Description:

The NTE912 consists of five general-purpose silicon NPN transistors on a common monolithic substrate in a 14-Lead DIP type package. Two of the transistors are internally connected to form a differentially-connected pair.

The transistors of the NTE912 are well suited to a wide variety of applications in low power systems in the DC through VHF range. They may be used as discrete transistors in conventional circuits. However, in addition, they provide the very significant inherent integrated circuit advantages of close electrical and thermal matching.

Features:

- Two Matched Pairs of Transistors:
 V_{BE} matched $\pm 5mV$
 Input Offset Current $2\mu A$ Max. @ $I_C = 1mA$
- 5 General Purpose Monolithic Transistors
- Operation from DC to 120MHz
- Wide Operating Current Range
- Low Noise Figure: 3.2dB Typ @ 1kHz

Applications:

- General Use In All Types of Signal Processing Systems Operating Anywhere in the Frequency Range from DC to VHF
- Custom Designed Differential Amplifiers
- Temperature Compensated Amplifiers

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

| | |
|------------------------------------------------------------------------------------------|-------------------------------|
| Power Dissipation ($T_A \leq +55^\circ C$), P_D | |
| Each Transistor | 300mW |
| Total Package | 750mW |
| Derate Above $55^\circ C$ | 6.67mW/ $^\circ C$ |
| Collector Emitter Voltage, V_{CEO} | 15V |
| Collector Base Voltage, V_{CBO} | 20V |
| Collector Substrate Voltage (Note 1), V_{CIO} | 20V |
| Emitter Base Voltage, V_{EBO} | 5V |
| Collector Current, I_C | 50mA |
| Operating Temperature Range, T_{opr} | -55° to $+125^\circ C$ |
| Storage Temperature Range, T_{stg} | -65° to $+150^\circ C$ |
| Lead Temperature (During Soldering, 1/16" \pm 1/32" from case, 10sec max), T_L | $+265^\circ C$ |

Note 1. The collector of each transistor is isolated from the substrate by an integral diode. The substrate (Pin13) 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 | | | | | | | |
| Collector Base Breakdown Voltage | $V_{(BR)CBO}$ | $I_C = 10\mu\text{A}, I_E = 0$ | 20 | 60 | – | V | |
| Collector Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C = 1\text{mA}, I_B = 0$ | 15 | 24 | – | V | |
| Collector Substrate Breakdown Voltage | $V_{(BR)CIO}$ | $I_C = 10\mu\text{A}, I_{CI} = 0$ | 20 | 60 | – | V | |
| Emitter Base Breakdown Voltage | $V_{(BR)EBO}$ | $I_E = 10\mu\text{A}, I_C = 0$ | 5 | 7 | – | V | |
| Collector Cutoff Current | I_{CBO} | $V_{CB} = 10\text{V}, I_E = 0$ | – | 0.002 | 40 | nA | |
| | I_{CEO} | $V_{CE} = 10\text{V}, I_B = 0$ | – | – | 0.5 | μA | |
| Static Forward Current Transfer Ratio | h_{FE} | $V_{CE} = 3\text{V}$ | $I_C = 10\text{mA}$ | – | 100 | – | |
| | | | $I_C = 1\text{mA}$ | 40 | 100 | – | |
| | | | $I_C = 10\mu\text{A}$ | – | 54 | – | |
| Input Offset Current for Matched Pair Q_1 and Q_2 . $ I_{O1} - I_{O2} $ | | $V_{CE} = 3\text{V}, I_C = 1\text{mA}$ | – | 0.3 | 2.0 | μA | |
| Base Emitter Voltage | V_{BE} | $V_{CE} = 3\text{V}$ | $I_E = 1\text{mA}$ | – | 0.715 | – | V |
| | | | $I_E = 10\text{mA}$ | – | 0.800 | – | V |
| Magnitude of Input Offset Voltage for Differential Pair $ V_{BE1} - V_{BE2} $ | | $V_{CE} = 3\text{V}, I_C = 1\text{mA}$ | – | 0.45 | 5.0 | mV | |
| Magnitude of Input Offset Voltage for Isolated Transistors $ V_{BE3} - V_{BE4} $ $ V_{BE4} - V_{BE5} $ $ V_{BE5} - V_{BE3} $ | | $V_{CE} = 3\text{V}, I_C = 1\text{mA}$ | – | 0.45 | 5.0 | mV | |
| Temperature Coefficient of Base Emitter Voltage | $\frac{\Delta V_{BE}}{\Delta T}$ | $V_{CE} = 3\text{V}, I_C = 1\text{mA}$ | – | –1.9 | – | mV/ $^\circ\text{C}$ | |
| Collector Emitter Saturation Voltage | V_{CES} | $I_B = 1\text{mA}, I_C = 10\text{mA}$ | – | 0.23 | – | V | |
| Temperature Coefficient: Magnitude of Input–Offset Voltage | $\frac{ \Delta V_{IO} }{\Delta T}$ | $V_{CE} = 3\text{V}, I_C = 1\text{mA}$ | – | 1.1 | – | $\mu\text{V}/^\circ\text{C}$ | |

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------|-----|----------------------|-----|------------------|
| Dynamic Characteristics | | | | | | |
| Low–Frequency Noise Figure | NF | $f = 1\text{kHz}, V_{CE} = 3\text{V}, I_C = 100\mu\text{A},$ Source Resistance = $1\text{k}\Omega$ | – | 3.25 | – | dB |
| Low–Frequency, Small–Signal Equivalent Circuit Characteristics: Forward Current Transfer Ratio | h_{fe} | $f = 1\text{kHz}, V_{CE} = 3\text{V}, I_C = 1\text{mA}$ | – | 110 | – | |
| Short–Circuit Input Impedance | h_{ie} | | – | 3.5 | – | $\text{k}\Omega$ |
| Open–Circuit Output Impedance | h_{oe} | | – | 15.6 | – | μmhos |
| Open–Circuit Reverse Voltage Transfer Ratio | h_{re} | | – | 1.8×10^{-4} | – | |
| Admittance Characteristics: Forward Transfer Admittance | Y_{fe} | $f = 1\text{kHz}, V_{CE} = 3\text{V}, I_C = 1\text{mA}$ | – | $31 - j1.5$ | – | |
| Input Admittance | Y_{ie} | | – | $0.3 + j0.04$ | – | |
| Output Admittance | Y_{oe} | | – | $0.001 + j0.03$ | – | |

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------------------------------------|----------|--------------------------|-----|------|-----|------|
| Dynamic Characteristics (Cont'd) | | | | | | |
| Gain-Bandwidth Product | f_T | $V_{CE} = 3V, I_C = 3mA$ | 300 | 550 | – | |
| Emitter Base Capacitance | C_{EB} | $V_{EB} = 3V, I_E = 0$ | – | 0.6 | – | pF |
| Collector Base Capacitance | C_{CB} | $V_{CB} = 3V, I_C = 0$ | – | 0.58 | – | pF |
| Collector Substrate Capacitance | C_{CI} | $V_{CS} = 3V, I_C = 0$ | – | 2.8 | – | pF |

Pin Connection Diagram

