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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 ±5mV
  Input Offset Current 2μA 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°C unless otherwise specified)

Power Dissipation ($T_A \le$ +55°C), P_D
- Each Transistor 300mW
- Total Package 750mW
- Derate Above 55°C . . . . . 6.67mW/°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°C
Storage Temperature Range, T_{stg} . . . . . –65° to +150°C
Lead Temperature (During Soldering, 1/16" ±1/32" from case, 10sec max), T_L . . . . . +265°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°C unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Static Characteristics							
Collector Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 10μA, I_E = 0		20	60	–	V
Collector Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 1mA, I_B = 0		15	24	–	V
Collector Substrate Breakdown Voltage	$V_{(BR)CIO}$	I_C = 10μA, I_{CI} = 0		20	60	–	V
Emitter Base Breakdown Voltage	$V_{(BR)EBO}$	I_E = 10μA, I_C = 0		5	7	–	V
Collector Cutoff Current	I_{CBO}	V_{CB} = 10V, I_E = 0		–	0.002	40	nA
	I_{CEO}	V_{CE} = 10V, I_B = 0		–	–	0.5	μA
Static Forward Current Transfer Ratio	h_{FE}	V_{CE} = 3V	I_C = 10mA	–	100	–	
			I_C = 1mA	40	100	–	
			I_C = 10μA	–	54	–	
Input Offset Current for Matched Pair Q_1 and Q_2. $\lvert I_{IO_1} - I_{IO_2} \rvert$		V_{CE} = 3V, I_C = 1mA		–	0.3	2.0	μA
Base Emitter Voltage	V_{BE}	V_{CE} = 3V	I_E = 1mA	–	0.715	–	V
			I_E = 10mA	–	0.800	–	V
Magnitude of Input Offset Voltage for Differential Pair $\lvert V_{BE_1} - V_{BE_2} \rvert$		V_{CE} = 3V, I_C = 1mA		–	0.45	5.0	mV
Magnitude of Input Offset Voltage for Isolated Transistors $\lvert V_{BE_3} - V_{BE_4} \rvert$ $\lvert V_{BE_4} - V_{BE_5} \rvert$ $\lvert V_{BE_5} - V_{BE_3} \rvert$		V_{CE} = 3V, I_C = 1mA		–	0.45	5.0	mV
Temperature Coefficient of Base Emitter Voltage	$\frac{\Delta V_{BE}}{\Delta T}$	V_{CE} = 3V, I_C = 1mA		–	–1.9	–	mV/°C
Collector Emitter Saturation Voltage	V_{CES}	I_B = 1mA, I_C = 10mA		–	0.23	–	V
Temperature Coefficient: Magnitude of Input–Offset Voltage	$\frac{\lvert \Delta V_{IO} \rvert}{\Delta T}$	V_{CE} = 3V, I_C = 1mA		–	1.1	–	μV/°C

Electrical Characteristics: (T_A = +25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Dynamic Characteristics						
Low–Frequency Noise Figure	NF	f = 1kHz, V_{CE} = 3V, I_C = 100μA, Source Resistance = 1kΩ	–	3.25	–	dB
Low–Frequency, Small–Signal Equivalent Circuit Characteristics: Forward Current Transfer Ratio	h_{fe}	f = 1kHz, V_{CE} = 3V, I_C = 1mA	–	110	–	
Short–Circuit Input Impedance	h_{ie}		–	3.5	–	kΩ
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 = 1kHz, V_{CE} = 3V, I_C = 1mA	–	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°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





