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NTE917
Integrated Circuit
Dual, Independent Transistor Array, Differential Amp

Description:

The NTE917 is an integrated circuit consisting of two independent differential amplifiers with associated constant–current transistors on a common monolithic substrate. The six NPN transistors which comprise the amplifiers are general purpose devices which exhibit low 1/f noise an a value of f_T in excess of 300MHz. These features make the NTE917 useful from DC to 120MHz. Bias and load resistors have been omitted to provide maximum application flexibility.

The monolithic construction of the NTE917 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.

The NTE917 is supplied in a 14–Lead DIP type plastic package with a limited temperature range. The availability of extra pins allows the introduction of an independent substrate connection for maximum flexibility.

Features:

- Two Different Amplifiers on a Common Substrate
- Independently Accessible Inputs and Outputs
- Maximum Input Offset Voltage: ±5mV
- Limited Temperature Range: –0° to +85°C

Applications:

- Dual Sense Amplifiers
- Dual Schmitt Triggers
- Multifunction Combinations – RF/Mixer/Oscillator; Converter/IF
- IF Amplifiers (Differential and/or Cascode)
- Product Detectors
- Doubly Balanced Modulators and Demodulators
- Balanced Quadrature Detectors
- Cascade Limiters
- Synchronous Detectors
- Pairs of Balanced Mixers
- Synthesizer Mixers
- Balanced (Push–Pull) Cascode Amplifiers

Absolute Maximum Ratings: (T_A = +25°C unless otherwise specified)

Power Dissipation, P_D
- Any One Transistor 300mW
- Total Package 750mW
- Derat Above +55°C . . . . . 6.67mW/°C

Operating Temperature Range, T_{opr} . . . . . –40° to +85°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

The following ratings apply for each transistor in the device:

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} 9V

Collector Current, I_C 50mA

Note 1. The collector of each transistor is isolated from the substrate by an integral diode. *The substrate must be connected to a voltage which is more negative than any collector voltage in order to maintain isolation between transistors and provide for normal transistor action. The substrate should be maintained at signal (AC) GND by means of a suitable grounding capacitor, to avoid undesired coupling between transistors.*

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

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Static Characteristics							
For Each Differential Amplifier Input Offset Voltage	V_{IO}	V_{CB} = 3V, $I_{E(Q3)} = I_{E(Q4)}$ = 2mA		–	0.45	5.0	mV
Input Offset Current	I_{IO}			–	0.3	2.0	μA
Input Bias Current	I_I			–	10	24	μA
Quiescent Operating Current Ratio	$\frac{I_{C(Q1)}}{I_{C(Q2)}}$ or $\frac{I_{C(Q5)}}{I_{C(Q6)}}$			0.98 to 1.02 (Typ)			
Temperature Coefficient Magnitude of Input Offset Voltage	$\frac{\Delta V_{IO}}{\Delta T}$			–	1.1	–	μV/°C
For Each Transistor DC Forward Base–Emitter Voltage	V_{BE}	V_{CB} = 3V	I_C = 50μA	–	0.630	0.70	V
			I_C = 1mA	–	0.715	0.80	V
			I_C = 3mA	–	0.750	0.85	V
			I_C = 10mA	–	0.800	0.90	V
Temperature Coefficient of Base–Emitter Voltage	$\frac{\Delta V_{BE}}{\Delta T}$	V_{CB} = 3V, I_C = 1mA		–	–1.9	–	μV/°C
Collector Cutoff Current	I_{CBO}	V_{CB} = 10V, I_E = 0		–	0.002	100	nA
Collector–Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 1mA, I_B = 0		15	24	–	V
Collector–Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 10μA, I_E = 0		20	60	–	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

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Dynamic Characteristics						
Common−Mode Rejection Ratio for Each Amplifier	CMRR	V_{CC} = 12V, V_{EE} = −6V, V_x = −3.3V, f = 1kHz	−	100	−	dB
AGC Range, One Stage	AGC		−	75	−	dB
Voltage Gain, Single Stage Double−Ended Output	A		−	32	−	dB
AGC Range, Two Stage	AGC		−	105	−	dB
Voltage Gain, Two Stage Double−Ended Output	A		−	60	−	dB
Low−Frequency, Small−Signal Equivalent−Circuit Characteristics (For Single Transistor)						
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	−	μmho
Open−Circuit Reverse Voltage Transfer Ratio	h_{re}		1.8×10^{-4} (Typ)			
1/f Noise Figure (For Single Transistor)	NF	f = 1kHz, V_{CE} = 3V	−	3.25	−	dB
Gain−Bandwidth Product (For Single Transistor)	f_T	V_{CE} = 3V, I_C = 3mA	−	550	−	MHz
Admittance Characteristics; Differential Circuit Configuration: (For Each Amplifier)						
Forward Transfer Admittance	y_{21}	V_{CB} = 3V Each Collector $I_C \approx$ 1.25mA, f = 1MHz	−20+j0 (Typ)			mmho
Input Admittance	y_{11}		0.22+j0.1 (Typ)			mmho
Output Admittance	y_{22}		0.01+j0 (Typ)			mmho
Reverse Transfer Admittance	y_{12}		−0.003+j0 (Typ)			mmho
Admittance Characteristics; Cascode Circuit Configuration: (For Each Amplifier)						
Forward Transfer Admittance	y_{21}	V_{CB} = 3V Total Stage $I_C \approx$ 2.5mA, f = 1MHz	68−j0 (Typ)			mmho
Input Admittance	y_{11}		0.55+j0 (Typ)			mmho
Output Admittance	y_{22}		0+j0.02 (Typ)			mmho
Reverse Transfer Admittance	y_{12}		0.004−j0.005 (Typ)			μmho
Noise Figure	NF	f = 100MHz	−	8	−	dB

Pin Connection Diagram