THAT Corporation

Quad Low-Noise NPN Transistor Array

THAT100

FEATURES

- Four Matched NPN Transistors
- Low noise — 0.8 $\text{nV}/\sqrt{\text{Hz}}$
- High Speed — 350 MHz f_t
- Excellent Matching — 500 µV typ
- Dielectrically Isolated
- 25 V V_{CEO}

APPLICATIONS

- Microphone Preamplifiers
- Tape Head Preamplifiers
- Current Sources
- Current Mirrors
- Log/Antilog Amplifiers
- Multipliers

DESCRIPTION

THAT100 is a quad, large-geometry monolithic NPN transistor array which combines low noise, high speed and excellent parametric matching. The large geometry typically results in 30Ω base spreading resistance, producing 0.8 $\text{nV}/\sqrt{\text{Hz}}$ voltage noise. This makes these parts an excellent choice for low-noise amplifier input stages.

Fabricated on a Complementary Bipolar Dielectrically Isolated process, all four transistors are electrically isolated from each other by a layer of oxide. The resulting low collector-to-substrate capacitance produces a typical f_t of 350 MHz, for AC performance similar to 2N3904-class devices. The dielectric isolation also minimizes crosstalk and provides complete DC isolation.

Substrate biasing is not required for normal operation, though the substrate should be grounded to optimize speed. The one-chip construction assures excellent parameter matching and tracking over temperature.

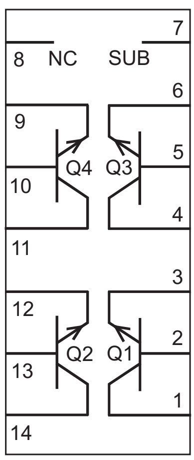

Figure 1. Pin Configuration

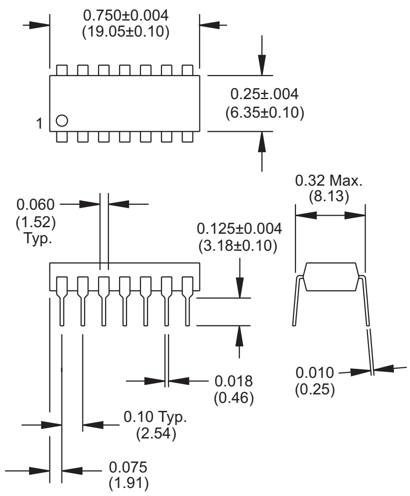

Figure 2. Dual-In-Line Package Outline

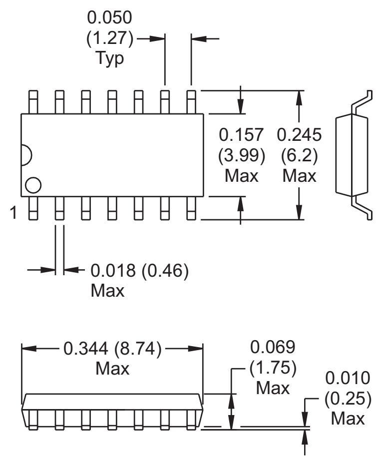

Figure 3. Surface Mount Package Outline

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Rev. 07/25/00

SPECIFICATIONS[1]

Maximum Ratings (T_A = 25°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Collector-Emitter Voltage	BV_{CEO}	I_C = 1 mAdc, I_B = 0	25	35	—	V
Collector-Base Voltage	BV_{CBO}	I_C = 10 µAdc, I_E = 0	25	35	—	V
Emitter-Base Voltage	BV_{EBO}	I_E = 10 µAdc, I_C = 0	5	—	—	V
Collector-Collector Voltage	BV_{CC}		±100	±200	—	V
Emitter-Emitter Voltage	BV_{EE}		±100	±200	—	V
Collector Current	I_C		10	20		mA
Emitter Current	I_E		10	20		mA
Operating Temperature Range	T_A		0		70	°C
Maximum Junction Temperature	T_{JMAX}				150	°C
Storage Temperature	T_{STORE}		-45		125	°C

Electrical Characteristics[2]

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Current Gain	h_{fe}	V_{CB} = 10 V				
		I_C = 1 mA	60	100	—	
		I_C = 10 µA	60	100	—	
Current Gain Matching	Δh_{fe}	V_{CB} = 10 V, I_C = 1 mA	—	5	—	%
Noise Voltage Density	e_N	V_{CB} = 10 V, I_C = 1 mA, 1 kHz	—	0.8	—	nV / $\sqrt{Hz}$
Gain-Bandwidth Product	f_t	I_C = 1 mA, V_{CB} = 10 V		350		MHz
ΔV_{BE} (V_{BE1}-V_{BE2}; V_{BE3}-V_{BE4})	V_{OS}	I_C = 1 mA	—	±0.5	±3	mV
		I_C = 10 µA	—	±0.5	±3	mV
ΔI_B (I_{B1}-I_{B2}; I_{B3}-I_{B4})	I_{OS}	I_C = 1 mA	—	±500	±1500	nA
		I_C = 10 µA	—	±5	±15	nA
Collector-Base Leakage Current	I_{CBO}	V_{CB} = 25 V	—	25	—	pA
Bulk Resistance	r_{BE}	V_{CB} = 0 V, 10µA < I_C < 10mA	—	2	—	Ω
Base Spreading Resistance	r_{bb}	V_{CB} = 10 V, I_C = 1mA	—	30	—	Ω
Collector Saturation Voltage	$V_{CE(SAT)}$	I_C = 1 mA, I_B = 100 µA	—	0.05		V
Output Capacitance	C_{OB}	V_{CB} = 10 V, I_E = 0 mA, 100 kHz		3		pF
Collector-Collector Capacitance Q_1/Q_2; Q_3/Q_4	C_{CC}	V_{CC} = 0 V, 100 kHz		0.7		pF

1. All specifications subject to change without notice.
2. Unless otherwise noted, T_A=25°C.

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