

### FEATURES

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

### 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  $30\Omega$  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  $350 \text{ MHz}$ , 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.

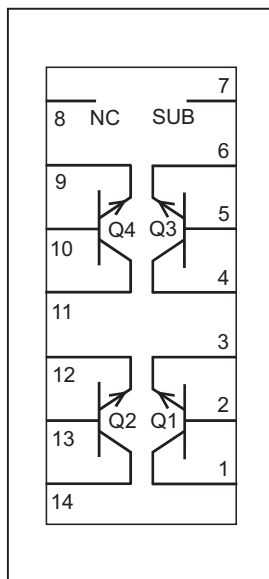


Figure 1. Pin Configuration

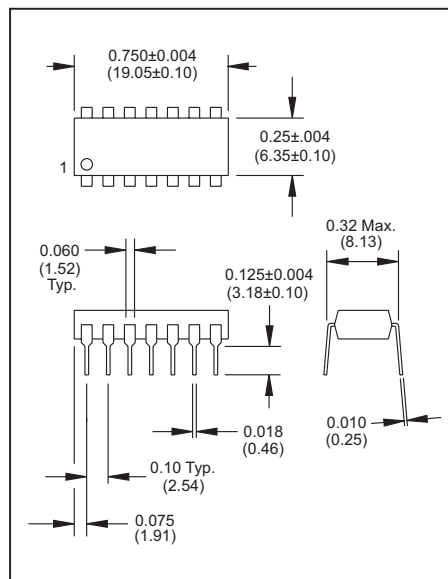


Figure 2. Dual-In-Line Package Outline

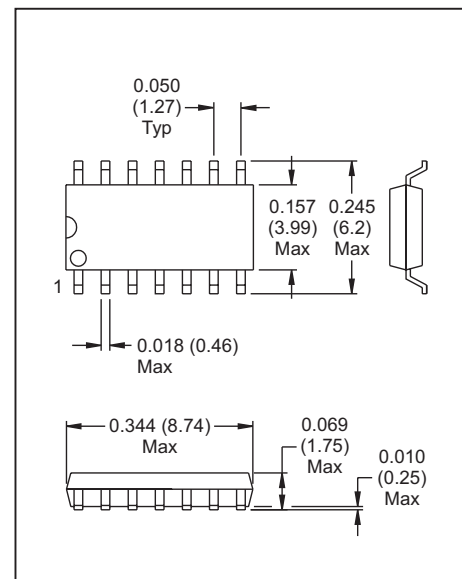


Figure 3. Surface Mount Package Outline

## SPECIFICATIONS<sup>1</sup>

<b>Maximum Ratings (<math>T_A = 25^\circ\text{C}</math>)</b>						
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Collector-Emitter Voltage	$BV_{CEO}$	$I_C = 1\text{ mA}, I_B = 0$	25	35	—	V
Collector-Base Voltage	$BV_{CBO}$	$I_C = 10\ \mu\text{A}, I_E = 0$	25	35	—	V
Emitter-Base Voltage	$BV_{EBO}$	$I_E = 10\ \mu\text{A}, I_C = 0$	5	—	—	V
Collector-Collector Voltage	$BV_{CC}$		$\pm 100$	$\pm 200$	—	V
Emitter-Emitter Voltage	$BV_{EE}$		$\pm 100$	$\pm 200$	—	V
Collector Current	$I_C$		10	20		mA
Emitter Current	$I_E$		10	20		mA
Operating Temperature Range	$T_A$		0		70	$^\circ\text{C}$
Maximum Junction Temperature	$T_{JMAX}$				150	$^\circ\text{C}$
Storage Temperature	$T_{STORE}$		-45		125	$^\circ\text{C}$

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

1. All specifications subject to change without notice.
2. Unless otherwise noted,  $T_A = 25^\circ\text{C}$ .