

**NTE100 (PNP) & NTE101 (NPN)
 Germanium Complementary Transistors
 Oscillator, Mixer for AM Radio,
 Medium Speed Switch**

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

Collector–Base Voltage, V_{CBO}	25V
Collector–Emitter Voltage (Note 1), V_{CEO}	
NTE100	24V
NTE101	25V
Emitter–Base Voltage, V_{EBO}	
NTE100	12V
NTE101	25V
Collector Current, I_C	
NTE100	100mA
NTE101	300mA
Emitter Current (NTE100 Only), I_E	100mA
Total Device Dissipation, P_D	150mW
Derate Above 25°C	2.5mW/ $^\circ\text{C}$
Operating Collector Junction Temperature, T_J	$+85^\circ\text{C}$
Storage Temperature Range, T_{stg}	-65° to $+100^\circ\text{C}$

Note 1. Punch-through voltage.

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

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Collector–Base Brteakdown Voltage NTE100	$V_{(BR)CBO}$	$I_E = 0$	$I_C = 20\mu\text{A}$	25	–	–	V
			$I_C = 100\mu\text{A}$	25	–	–	V
Emitter–Base Breakdown Voltage NTE100	$V_{(BR)EBO}$	$I_C = 0$	$I_E = 20\mu\text{A}$	12	–	–	V
			$I_E = 100\mu\text{A}$	25	–	–	V
Punch Through Voltage NTE100	V_{PT}	$V_{EBfl} = 1\text{V}$, Note 2		24	–	–	V
				25	–	–	V
Collector Cutoff Current NTE100	I_{CBO}	$I_E = 0$	$V_{CB} = 12\text{V}$	–	1	5	μA
			$V_{CB} = 12\text{V}$, $T_A = +80^\circ\text{C}$	–	40	90	μA
			$V_{CB} = 25\text{V}$	–	3	6	μA
NTE101							

Note 2. V_{PT} is determined by measuring the Emitter–Base floating potential V_{EBfl} . The Collector–Base Voltage, V_{CB} , is increased until $V_{EBfl} = 1\text{V}$; this value of $V_{CB} = (V_{PT} + 1\text{V})$. Care must be taken not to exceed maximum Collector–Base Voltage specified under maximum ratings.

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

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Emitter Cutoff Current NTE100	I_{EBO}	$I_C = 0$	$V_{EB} = 2.5\text{V}$	–	1	2.5	μA
			$V_{EB} = 25\text{V}$	–	2	6	μA
Static Forward Current Transfer Ratio NTE100	h_{FE}	$V_{CE} = 0.15\text{V}, I_C = 12\text{mA}$		30	100	–	
		$V_{CE} = 0.20\text{V}, I_C = 24\text{mA}$		24	110	–	
		$V_{CE} = 1\text{V}, I_C = 10\text{mA}$		20	100	–	
		$V_{CE} = 0.35\text{V}, I_C = 200\text{mA}$		10	100	–	
Base–Emitter Voltage NTE100	V_{BE}	$I_B = 0.4\text{mA}, I_C = 12\text{mA}$		–	0.26	0.35	V
		$I_B = 1\text{mA}, I_C = 24\text{mA}$		–	0.30	0.40	V
		$I_B = 0.5\text{mA}, I_C = 10\text{mA}$		0.15	0.22	0.40	V
Collector–Emitter Saturation Voltage NTE100	$V_{CE(sat)}$	$I_B = 0.4\text{mA}, I_C = 12\text{mA}$		–	0.08	0.15	V
		$I_B = 1\text{mA}, I_C = 24\text{mA}$		–	0.08	0.20	V
		$I_B = 0.5\text{mA}, I_C = 10\text{mA}$		–	0.07	0.20	V
Small–Signal Forward Current Transfer Ratio NTE100	h_{fe}	$V_{CE} = 6\text{V}$	$I_C = 1\text{mA}, f = 1\text{kHz}$	–	135	–	
		$V_{CE} = 5\text{V}$		–	105	–	
Output Capacitance NTE100	C_{ob}	$V_{CB} = 6\text{V}$	$I_E = 0, f = 1\text{MHz}$	–	9	20	pF
		$V_{CB} = 5\text{V}$		–	14	20	pF
Switching Characteristics							
Delay Time NTE100	t_d	$I_C = 10\text{mA}, I_{B(1)} = 1.3\text{mA}, I_{B(2)} = 0.7\text{mA}, V_{BE(off)} = 0.8\text{V}, R_L = 1\text{k}\Omega$		–	0.14	–	μs
				–	0.07	–	μs
Rise Time	t_r			–	0.20	–	μs
Storage Time NTE100	t_s			–	0.38	–	μs
				–	0.70	–	μs
Fall Time NTE100	t_f			–	0.19	–	μs
				–	0.40	–	μs
Stored Base Charge	Q_{sb}	$I_{B(1)} = 1\text{mA}, I_C = 10\text{mA}$		–	800	1400	pcb

