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## 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 $25^\circ\text{C}$ .....	2.5mW/ $^\circ\text{C}$
Operating Collector Junction Temperature, $T_J$ .....	$+85^\circ\text{C}$
Storage Temperature Range, $T_{stg}$ .....	$-65^\circ$ 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 Breakdown Voltage NTE100	$V_{(BR)CBO}$	$I_E = 0$ $I_C = 20\mu\text{A}$	25	–	–	V	
NTE101			$I_C = 100\mu\text{A}$	25	–	–	V
Emitter–Base Breakdown Voltage NTE100	$V_{(BR)EBO}$	$I_C = 0$ $I_E = 20\mu\text{A}$	12	–	–	V	
NTE101			$I_E = 100\mu\text{A}$	25	–	–	V
Punch Through Voltage NTE100	$V_{PT}$	$V_{EBfl} = 1\text{V}$ , Note 2	24	–	–	V	
NTE101			25	–	–	V	
Collector Cutoff Current NTE100	$I_{CBO}$	$I_E = 0$ $V_{CB} = 12\text{V}$	–	1	5	$\mu\text{A}$	
			$V_{CB} = 12\text{V}$ , $T_A = +80^\circ\text{C}$	–	40	90	$\mu\text{A}$
NTE101			$V_{CB} = 25\text{V}$	–	3	6	$\mu\text{A}$

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	$\mu\text{A}$
			$V_{EB} = 25\text{V}$	-	2	6	$\mu\text{A}$
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
<b>Switching Characteristics</b>							
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	-	$\mu\text{s}$	
			NTE101	-	0.07	-	$\mu\text{s}$
Rise Time	$t_r$		-	0.20	-	$\mu\text{s}$	
Storage Time NTE100	$t_s$		-	0.38	-	$\mu\text{s}$	
			NTE101	-	0.70	-	$\mu\text{s}$
Fall Time NTE100	$t_f$		-	0.19	-	$\mu\text{s}$	
			NTE101	-	0.40	-	$\mu\text{s}$
Stored Base Charge	$Q_{sb}$	$I_{B(1)} = 1\text{mA}, I_C = 10\text{mA}$	-	800	1400	pcb	

