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## NTE2406 Silicon NPN Transistor General Purpose Amp, Surface Mount (Compl to NTE2407)

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

Collector–Base Voltage, $V_{CBO}$ .....	75V
Collector–Emitter Voltage, $V_{CEO}$ .....	40V
Emitter–Base Voltage, $V_{EBO}$ .....	6V
Continuous Collector Current, $I_C$ .....	600mA
Total Device Dissipation (FR–5 Board, Note 1), $P_D$ .....	225mW
Derate above $+25^\circ\text{C}$ .....	1.8mW/ $^\circ\text{C}$
Thermal Resistance, Junction–to–Ambient (FR–5 Board, Note 1), $R_{thJA}$ .....	556 $^\circ\text{C}/\text{W}$
Total Device Dissipation (Alumina Substrate, Note 2), $P_D$ .....	300mW
Derate above $+25^\circ\text{C}$ .....	2.4mW/ $^\circ\text{C}$
Thermal Resistance, Junction–to–Ambient (Alumina Substrate, Note 2), $R_{thJA}$ .....	417 $^\circ\text{C}/\text{W}$
Operating Junction Temperature Range, $T_J$ .....	$-55^\circ$ to $+150^\circ\text{C}$
Storage Temperature Range, $T_{stg}$ .....	$-55^\circ$ to $+150^\circ\text{C}$

Note 1. FR–5 = 1.000 (25.4mm) x .750 (19.05mm) x .062 (1.57mm).

Note 2. Alumina = .400 (10.2mm) x .300 (7.62mm) x .024 (.609mm), 99.5% alumina.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Collector–Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 10\mu\text{A}, I_E = 0$	75	–	–	V
Collector–Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 10\text{mA}, I_B = 0$	40	–	–	V
Emitter–Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}, I_C = 0$	6	–	–	V
Collector Cutoff Current	$I_{CBO}$	$V_{CB} = 60\text{V}, I_E = 0$	–	–	0.01	$\mu\text{A}$
		$V_{CB} = 60\text{V}, I_E = 0, T_A = +125^\circ\text{C}$	–	–	10	$\mu\text{A}$
	$I_{CEX}$	$V_{CE} = 60\text{V}, V_{EB(off)} = 3\text{V}$	–	–	10	nA
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = 3\text{V}, I_C = 0$	–	–	10	nA
Base Cutoff Current	$I_{BL}$	$V_{CE} = 60\text{V}, V_{EB(off)} = 3\text{V}$	–	–	20	nA

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>ON Characteristics (Note 3)</b>						
DC Current Gain	$h_{FE}$	$V_{CE} = 10\text{V}, I_C = 0.1\text{mA}$	35	–	–	
		$V_{CE} = 10\text{V}, I_C = 1\text{mA}$	50	–	–	
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}$	75	–	–	
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}, T_A = -55^\circ\text{C}$	35	–	–	
		$V_{CE} = 1\text{V}, I_C = 150\text{mA}$	50	–	–	
		$V_{CE} = 10\text{V}, I_C = 150\text{mA}$	100	–	300	
		$V_{CE} = 10\text{V}, I_C = 500\text{mA}$	40	–	–	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	–	–	0.3	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	–	–	1.0	V
Base–Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	0.6	–	1.2	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	–	–	2.0	V
<b>Small–Signal Characteristics</b>						
Current Gain–Bandwidth Product	$f_T$	$I_C = 20\text{mA}, V_{CB} = 20\text{V}, f = 100\text{MHz}$	300	–	–	MHz
Output Capacitance	$C_{obo}$	$V_{CB} = 10\text{V}, I_E = 0, f = 1\text{MHz}$	–	–	8	pF
Input Capacitance	$C_{ibo}$	$V_{EB} = 0.5\text{V}, I_C = 0, f = 1\text{MHz}$	–	–	25	pF
Input Impedance	$h_{ie}$	$V_{CE} = 10\text{V}, I_C = 1\text{mA}, f = 1\text{kHz}$	2	–	8	$k\Omega$
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}, f = 1\text{kHz}$	0.25	–	1.25	$k\Omega$
Voltage Feedback Ratio	$h_{re}$	$V_{CE} = 10\text{V}, I_C = 1\text{mA}, f = 1\text{kHz}$	–	–	8	$\times 10^4$
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}, f = 1\text{kHz}$	–	–	4	$\times 10^4$
Small–Signal Current Gain	$h_{fe}$	$V_{CE} = 10\text{V}, I_C = 1\text{mA}, f = 1\text{kHz}$	50	–	300	
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}, f = 1\text{kHz}$	75	–	375	
Output Admittance	$h_{oe}$	$V_{CE} = 10\text{V}, I_C = 1\text{mA}, f = 1\text{kHz}$	5	–	35	$\mu\text{mhos}$
		$V_{CE} = 10\text{V}, I_C = 10\text{mA}, f = 1\text{kHz}$	25	–	200	$\mu\text{mhos}$
Collector–Base Time Constant	$r_b' C_c$	$V_{CB} = 20\text{V}, I_E = 20\text{mA}, f = 31.8\text{MHz}$	–	–	150	ps
Noise Figure	NF	$I_C = 100\mu\text{A}, V_{CE} = 10\text{V}, R_S = 1k\Omega, f = 1\text{kHz}$	–	–	4	dB
<b>Switching Characteristics</b>						
Delay Time	$t_d$	$V_{CC} = 30\text{V}, I_C = 150\text{mA}, V_{BE(off)} = 0.5\text{V}, I_{B1} = 15\text{mA}$	–	–	10	ns
Rise Time	$t_r$		–	–	25	ns
Storage Time	$t_s$	$V_{CC} = 30\text{V}, I_C = 150\text{mA}, I_{B1} = I_{B2} = 15\text{mA}$	–	–	225	ns
Fall Time	$t_f$		–	–	60	ns

Note 3. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

