

## NTE2312 Silicon NPN Transistor High Voltage, High Speed Switch

**Description:**

The NTE2312 is a silicon NPN transistor in a TO220 type package designed for high-voltage, high-speed power switching inductive circuits where fall time is critical. This device is particularly suited for 115V and 220V switch-mode applications such as switching regulators, inverters, motor controls, solenoid/relay drivers, and deflection circuits.

**Absolute Maximum Ratings:**

Collector-Emitter Voltage, $V_{CEO(sus)}$ .....	400V
Collector-Emitter Voltage, $V_{CEV}$ .....	700V
Emitter-Base Voltage, $V_{EBO}$ .....	9V
Collector Current, $I_C$	
Continuous .....	8A
Peak (Note 1) .....	16A
Base Current, $I_B$	
Continuous .....	4A
Peak (Note 1) .....	8A
Emitter Current, $I_E$	
Continuous .....	12A
Peak (Note 1) .....	24A
Total Power Dissipation ( $T_A = +25^\circ\text{C}$ ), $P_D$ .....	2W
Derate Above $25^\circ\text{C}$ .....	16mW/ $^\circ\text{C}$
Total Power Dissipation ( $T_C = +25^\circ\text{C}$ ), $P_D$ .....	80W
Derate Above $25^\circ\text{C}$ .....	640mW/ $^\circ\text{C}$
Operating Junction Temperature Range, $T_J$ .....	$-65^\circ$ to $+150^\circ\text{C}$
Storage Temperature Range, $T_{stg}$ .....	$-65^\circ$ to $+150^\circ\text{C}$
Thermal Resistance, Junction-to-Case, $R_{thJC}$ .....	1.56 $^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient, $R_{thJA}$ .....	62.5 $^\circ\text{C}/\text{W}$
Lead Temperature (During Soldering, 1/8" from case, 5sec), $T_L$ .....	$+275^\circ\text{C}$

Note 1. Pulse Test: Pulse Width = 5ms, Duty Cycle  $\leq$  10%.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF Characteristics</b> (Note 2)						
Collector–Emitter Sustaining Voltage	$V_{CEO(sus)}$	$I_C = 10\text{mA}, I_B = 0$	400	–	–	V
Collector Cutoff Current	$I_{CEV}$	$V_{CEV} = 700\text{V}, V_{BE(off)} = 1.5\text{V}$	–	–	1	mA
		$V_{CEV} = 700\text{V}, V_{BE(off)} = 1.5\text{V}, T_C = +100^\circ\text{C}$	–	–	5	mA
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = 9\text{V}, I_C = 0$	–	–	1	mA
<b>ON Characteristics</b> (Note 2)						
DC Current Gain	$h_{FE}$	$I_C = 2\text{A}, V_{CE} = 5\text{V}$	8	–	60	
		$I_C = 5\text{A}, V_{CE} = 5\text{V}$	5	–	30	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 2\text{A}, I_B = 0.4\text{A}$	–	–	1	V
		$I_C = 5\text{A}, I_B = 1\text{A}$	–	–	2	V
		$I_C = 8\text{A}, I_B = 2\text{A}$	–	–	3	V
		$I_C = 5\text{A}, I_B = 1\text{A}, T_C = +100^\circ\text{C}$	–	–	3	V
Base–Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 2\text{A}, I_B = 0.4\text{A}$	–	–	1.2	V
		$I_C = 5\text{A}, I_B = 1\text{A}$	–	–	1.6	V
		$I_C = 5\text{A}, I_B = 1\text{A}, T_C = +100^\circ\text{C}$	–	–	1.5	V
<b>Dynamic Characteristics</b>						
Current–Gain Bandwidth Product	$f_T$	$I_C = 500\text{mA}, V_{CE} = 10\text{V}, f = 1\text{MHz}$	4	–	–	MHz
Output Capacitance	$C_{ob}$	$V_{CB} = -10\text{V}, I_E = 0, f = 0.1\text{MHz}$	–	110	–	pF
<b>Switching Characteristics</b> (Resistive Load)						
Delay Time	$t_d$	$V_{CC} = 125\text{V}, I_C = 5\text{A}, I_{B1} = I_{B2} = 1\text{A}, t_p = 25\mu\text{s}, \text{Duty Cycle} \leq 1\%$	–	0.05	0.1	$\mu\text{s}$
Rise Time	$t_r$		–	0.8	1.5	$\mu\text{s}$
Storage Time	$t_s$		–	1.0	3.0	$\mu\text{s}$
Fall Time	$t_f$		–	0.15	0.7	$\mu\text{s}$
<b>Switching Characteristics</b> (Inductive Load), Clamped						
Voltage Storage Time	$t_{sv}$	$I_C = 5\text{A}, V_{clamp} = 300\text{V}, I_{B1} = 1\text{A}, V_{BE(off)} = 5\text{V}, T_C = +100^\circ\text{C}$	–	0.86	2.3	$\mu\text{s}$
Crossover Time	$t_c$		–	0.14	0.7	$\mu\text{s}$

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

