



ELECTRONICS, INC.
 44 FARRAND STREET
 BLOOMFIELD, NJ 07003
 (973) 748-5089

NTE2333

Silicon NPN Power Transistor for Switching Power Applications

Description:

The NTE2333 is a silicon NPN Power Transistor in a TO220 package designed for use in 220V line-operated Switchmode Power supplies and electronic light ballasts.

Features:

- Improved Efficiency Due to Low Base Drive Requirements:
 - High and Flat DC Current Gain h_{FE}
 - Fast Switching
 - No Coil Required in Base Circuit for Turn-Off (No Current Tail)

Absolute Maximum Ratings:

Collector-Emitter Sustaining Voltage, V_{CEO}	450V
Collector-Emitter Breakdown Voltage, V_{CES}	1000V
Emitter-Base Voltage, V_{EBO}	9V
Collector Current, I_C	
Continuous	6A
Peak (Note 1)	15A
Base Current, I_B	
Continuous	4A
Peak (Note 1)	8A
Total Power Dissipation ($T_C = +25^\circ C$), P_D	100W
Derate above $25^\circ C$	0.8W/ $^\circ C$
Junction Temperature, T_J	+150 $^\circ C$
Storage Temperature Range, T_{stg}	-65 $^\circ$ to +150 $^\circ C$
Maximum Thermal Resistance, Junction-to-Case, R_{thJC}	1.25 $^\circ C/W$
Maximum Thermal Resistance, Junction-to-Ambient, R_{thJA}	62.5 $^\circ C/W$
Maximum Lead Temperature (During Soldering, 1/8" from Case for 5sec), T_L	+260 $^\circ C$

- Note 1. Pulse Test: Pulse Width = 5ms, Duty Cycle \leq 10%.
 Note 2. Proper strike and creepage distance must be provided.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit		
OFF Characteristics								
Collector–Emitter Sustaining Voltage	$V_{CEO(sus)}$	$I_C = 100\text{mA}$, $L = 25\text{mH}$	450	–	–	V		
Collector Cutoff Current	I_{CEO}	$V_{CE} = 450\text{V}$, $I_B = 0$	–	–	100	μA		
		$V_{CE} = 1000\text{V}$, $V_{EB} = 0$	–	–	100	μA		
	I_{CES}	$V_{CE} = 1000\text{V}$, $V_{EB} = 0$, $T_C = +125^\circ\text{C}$	–	–	500	μA		
		$V_{CE} = 800\text{V}$, $V_{EB} = 0$, $T_C = +125^\circ\text{C}$	–	–	100	μA		
Emitter Cutoff Current	I_{EBO}	$V_{EB} = 9\text{V}$, $I_C = 0$	–	–	100	μA		
ON Characteristics								
Base–Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 1.3\text{A}$, $I_B = 0.13\text{A}$	–	0.83	1.2	V		
		$I_C = 3\text{A}$, $I_B = 0.6\text{A}$	–	0.94	1.3	V		
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 1.3\text{A}$, $I_B = 0.13\text{A}$		–	0.25	0.6	V	
			$T_C = +125^\circ\text{C}$	–	0.27	0.65	V	
		$I_C = 3\text{A}$, $I_B = 0.6\text{A}$		–	0.35	0.7	V	
			$T_C = +125^\circ\text{C}$	–	0.4	0.8	V	
DC Current Gain	h_{FE}	$I_C = 0.5\text{A}$, $V_{CE} = 5\text{V}$		14	–	34		
			$T_C = +125^\circ\text{C}$	–	32	–		
		$I_C = 3\text{A}$, $V_{CE} = 1\text{V}$		6	10	–	V	
			$T_C = +125^\circ\text{C}$	5	8	–		
			$T_C = +25^\circ\text{C}$ to $+125^\circ\text{C}$	11	17	–		
$I_C = 10\text{mA}$, $V_{CE} = 5\text{V}$	$T_C = +25^\circ\text{C}$ to $+125^\circ\text{C}$	10	22	–				
Dynamic Characteristics								
Current Gain Bandwidth Product	f_T	$I_C = 0.5\text{A}$, $V_{CE} = 10\text{V}$, $f = 1\text{MHz}$	–	14	–	MHz		
Output Capacitance	C_{ob}	$V_{CB} = 10\text{V}$, $I_B = 0$, $f = 1\text{MHz}$	–	75	120	pF		
Input Capacitance	C_{ib}	$V_{EB} = 8\text{V}$	–	1000	1500	pF		
Dynamic Saturation Voltage: Determined $1\mu\text{s}$ and $3\mu\text{s}$ respectively after rising I_{B1} reaches 90% of final I_{B1}	$V_{CE(dsat)}$	$I_C = 1.3\text{A}$, $I_{B1} = 130\text{mA}$, $V_{CC} = 300\text{V}$	$1\mu\text{s}$		–	5.5	–	V
				$T_C = +125^\circ\text{C}$	–	12.0	–	V
			$3\mu\text{s}$		–	3.0	–	V
				$T_C = +125^\circ\text{C}$	–	7.0	–	V
		$I_C = 3.0\text{A}$, $I_{B1} = 600\text{mA}$, $V_{CC} = 300\text{V}$	$1\mu\text{s}$		–	9.5	–	V
				$T_C = +125^\circ\text{C}$	–	14.5	–	V
$3\mu\text{s}$		–	2.0	–	V			
	$T_C = +125^\circ\text{C}$	–	7.5	–	V			
Switching Characteristics: Resistive Load ($DC \leq 10\%$, Pulse Width = $20\mu\text{s}$)								
Turn–On Time	t_{on}	$I_C = 3\text{A}$, $I_{B1} = 600\text{mA}$, $I_{B2} = 1.5\text{A}$, $V_{CC} = 300\text{V}$		–	90	180	ns	
			$T_C = +125^\circ\text{C}$	–	100	–	ns	
Turn–Off Time	t_{off}			–	1.7	2.5	μs	
			$T_C = +125^\circ\text{C}$	–	2.1	–	μs	
Turn–On Time	t_{on}	$I_C = 1.3\text{A}$, $I_{B1} = 130\text{mA}$, $I_{B2} = 650\text{mA}$, $V_{CC} = 300\text{V}$		–	200	300	ns	
			$T_C = +125^\circ\text{C}$	–	130	–	ns	
Turn–Off Time	t_{off}			–	1.2	2.5	μs	
			$T_C = +125^\circ\text{C}$	–	1.5	–	μs	

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Switching Characteristics: Inductive Load ($V_{\text{clamp}} = 300\text{V}$, $V_{\text{CC}} = 15\text{V}$, $I = 200\mu\text{H}$)							
Fall Time	t_{fi}	$I_C = 1.5\text{A}$, $I_{\text{B1}} = 130\text{mA}$, $I_{\text{B2}} = 650\text{mA}$		100	180	ns	
			$T_C = +125^\circ\text{C}$	-	120	-	ns
Storage Time	t_{si}			-	1.5	2.5	μs
			$T_C = +125^\circ\text{C}$	-	1.9	-	μs
Crossover Time	t_c		-	220	350	ns	
		$T_C = +125^\circ\text{C}$	-	230	-	ns	
Fall Time	t_{fi}	$I_C = 3\text{A}$, $I_{\text{B1}} = 600\text{mA}$, $I_{\text{B2}} = 1.5\text{A}$		85	150	ns	
			$T_C = +125^\circ\text{C}$	-	120	-	ns
Storage Time	t_{si}			-	2.15	3.2	μs
			$T_C = +125^\circ\text{C}$	-	2.75	-	μs
Crossover Time	t_c		-	200	300	ns	
		$T_C = +125^\circ\text{C}$	-	310	-	ns	

