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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°C), P_D 100W
Derate above 25°C . . . . 0.8W/°C
Junction Temperature, T_J . . . . +150°C
Storage Temperature Range, T_{stg} . . . . –65° to +150°C
Maximum Thermal Resistance, Junction–to–Case, R_{thJC} . . . . 1.25°C/W
Maximum Thermal Resistance, Junction–to–Ambient, R_{thJA} . . . . 62.5°C/W
Maximum Lead Temperature (During Soldering, 1/8” from Case for 5sec), T_L . . . . +260°C

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

Electrical Characteristics: (T_C = +25°C, unless otherwise specified)

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

Electrical Characteristics (Cont'd): (T_C = +25°C, unless otherwise specified)

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