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NTE53 **Silicon NPN Transistor** **High Voltage, High Speed Switch** **TO-3 Type Package**

Description:

The NTE53 is a silicon NPN transistor in a TO-3 type package designed for high voltage, high-speed power switching in inductive circuits where fall time is critical. This device is particularly suited for 115V and 220V line-operated switch-mode applications.

Applications:

- Switching Regulators
- PWM Inverters and Motor Controls
- Deflection Circuits
- Solenoid and Relay Drivers

Absolute Maximum Ratings:

Collector-Emitter Voltage, $V_{CEO(sus)}$	400V
Collector-Emitter Voltage, $V_{CEX(sus)}$	450V
Collector-Emitter Voltage, V_{CEV}	850V
Emitter-Base Voltage, V_{EB}	9V
Collector Current, I_C	
Continuous	15A
Peak (Note 1)	30A
Base Current, I_B	
Continuous	10A
Peak (Note 1)	20A
Total Device Dissipation ($T_C = +25^\circ\text{C}$), P_D	175W
Derate Above 25°C	1.0W/ $^\circ\text{C}$
Total Device Dissipation ($T_C = +100^\circ\text{C}$), P_D	100W
Operating Junction Temperature Range, T_J	-65° to $+200^\circ\text{C}$
Storage Temperature Range, T_{stg}	-65° to $+200^\circ\text{C}$
Thermal Resistance, Junction-to-Case, R_{thJC}	1.0 $^\circ\text{C/W}$
Maximum 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
OFF Characteristics (Note 2)						
Collector–Emitter Sustaining Voltage	V _{CEO(sus)}	I _C = 100mA, I _B = 0	400	–	–	V
	V _{CEX(sus)}	I _C = 8A, V _{clamp} = 450V, T _C = +100°C	450	–	–	V
		I _C = 15A, V _{clamp} = 300V, T _C = +100°C	300	–	–	V
Collector Cutoff Current	I _{CEV}	V _{CEV} = 850V, V _{BE(off)} = 1.5V	–	–	1.0	mA
		V _{CEV} = 850V, V _{BE(off)} = 1.5V, T _C = +100°C	–	–	4.0	mA
	I _{CER}	V _{CE} = 850V, R _{BE} = 50Ω, T _C = +100°C	–	–	5.0	mA
Emitter Cutoff Current	I _{EBO}	V _{EB} = 9V, I _C = 0	–	–	1.0	mA
Second Breakdown						
Second Breakdown Collector Current with Base Forward Bias	I _{S/b}	V _{CE} = 100V, t = 1.0s (non-repetitive)	0.2	–	–	A
ON Characteristics (Note 2)						
DC Current Gain	h _{FE}	V _{CE} = 2V, I _C = 5A	12	–	60	
		V _{CE} = 2V, I _C = 10A	6	–	30	
Collector–Emitter Saturation Voltage	V _{CE(sat)}	I _C = 10A, I _B = 2A	–	–	1.5	V
		I _C = 10A, I _B = 2A, T _C = +100°C	–	–	2.5	V
		I _C = 15A, I _B = 3A	–	–	5.0	V
Base–Emitter Saturation Voltage	V _{BE(sat)}	I _C = 10A, I _B = 2A	–	–	1.6	V
		I _C = 10A, I _B = 2A, T _C = +100°C	–	–	1.6	V
Dynamic Characteristics						
Current Gain–Bandwidth Product	f _T	V _{CE} = 10V, I _C = 500mA, f = 1MHz	6	–	28	MHz
Output Capacitance	C _{ob}	V _{CB} = 10V, I _E = 0, f = 1MHz	125	–	500	pF
Switching Characteristics (Resistive Load)						
Delay Time	t _d	V _{CC} = 250V, I _C = 10A, I _{B1} = I _{B2} = 2A, t _p = 300μs, Duty Cycle ≤ 2%	–	–	0.05	μs
Rise Time	t _r		–	–	1.0	μs
Storage Time	t _s		–	–	4.0	μs
Fall Time	t _f		–	–	0.7	μs
Switching Characteristics (Inductive Load, Clamped)						
Storage Time	t _{sv}	I _C = 10A peak, V _{clamp} = 450V, I _{B1} = 2A, V _{BE(off)} = 5V	–	2.0	–	μs
Fall Time	t _{fi}		0.09	–	–	μs
Storage Time	t _{sv}	I _C = 10A peak, V _{clamp} = 450V, I _{B1} = 2A, V _{BE(off)} = 5V, T _J = +100°C	–	–	5.0	μs
Fall Time	t _{fi}		–	–	1.5	μs

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

