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NTE99
Silicon NPN Transistor
Darlington W/Base–Emitter Speed–up Diode

Description:
The NTE99 is a silicon NPN Darlington transistor in a TO3 type package designed for high–voltage, high–speed, power switching in inductive circuits where fall time is critical. This device is particularly suited for line–operated switchmode applications.

Applications:
- Switching Regulators
- Motor Controls
- Inverters
- Solenoid and Relay Drivers

Features:
- Fast Turn–Off Times:
  1.0µs (max) Inductive Crossover Time – 20 Amps
  2.5µs (max) Inductive Storage Time – 20 Amps
- Operating Temperature Range: –65° to +200°C

Absolute Maximum Ratings:
Collector–Emitter Voltage, V_{CEO} 400V
Collector–Emitter Voltage, V_{CEV} 600V
Emitter–Base Voltage, V_{EB} 8V
Collector Current, I_C
  Continuous 50A
  Peak (Note 1) 75A
Base Current, I_B
  Continuous 10A
  Peak (Note 1) 15A
Total Power Dissipation, P_D
  T_C = +25°C 250W
  Derate Above 25°C . . . . 1.43W/°C
  T_C = +100°C 143W
Operating Junction Temperature Range, T_J . . . . –65° to +200°C
Storage Temperature Range, T_{stg} . . . . –65° to +200°C
Thermal Resistance, Junction–to–Case, R_{thJC} . . . . 0.7°C/W
Maximum Lead Temperature (During Soldering, 1/8” from case for 5sec), T_L . . . . +275°C

Note 1. Pulse Test: Pulse Width = 5ms, Duty Cycle ≤ 10%.

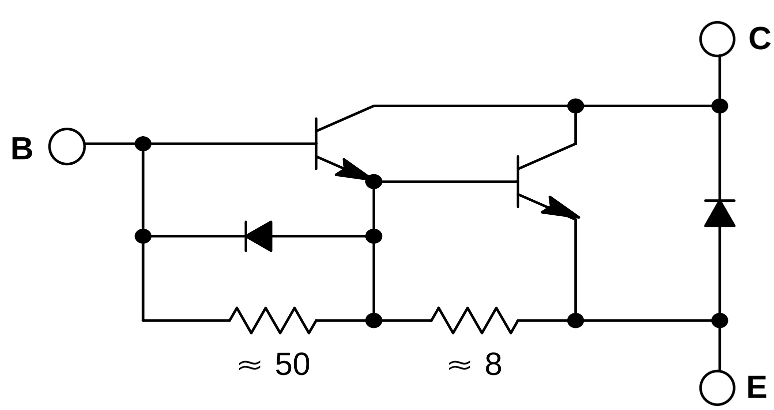
Electrical Characteristics: (T_C = +25°C unless otherwise specified)

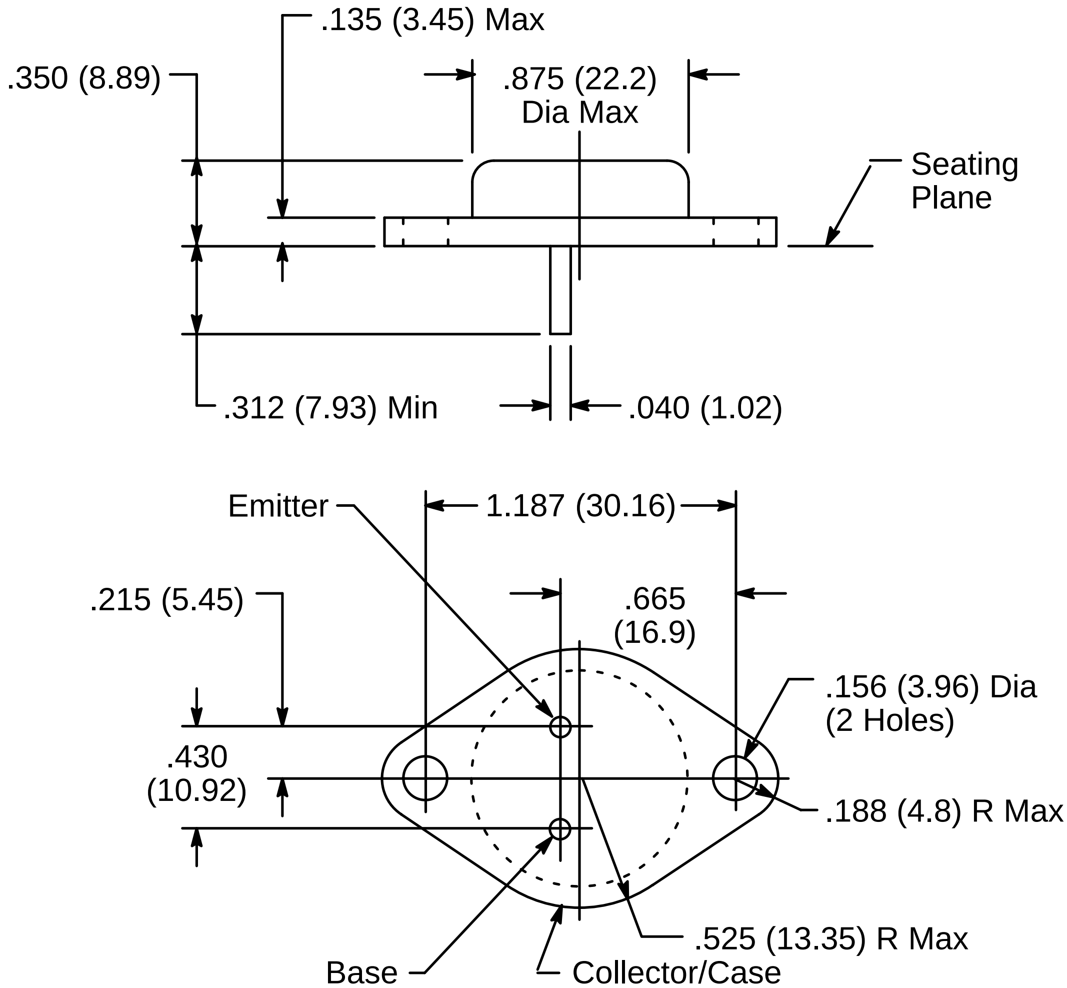
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics (Note 2)						
Collector–Emitter Sustaining Voltage	$V_{CEO(sus)}$	I_C = 100mA, I_B = 0, V_{clamp} = 400V	400	–	–	V
Collector Cutoff Current	I_{CEV}	V_{CEV} = 600V, $V_{BE(off)}$ = 1.5V	–	–	0.25	mA
Emitter Cutoff Current	I_{EBO}	V_{BE} = 2V, I_C = 0	–	–	350	mA
ON Characteristics (Note 2)						
DC Current Gain	h_{FE}	I_C = 20A, V_{CE} = 5V	25	–	–	
		I_C = 40A, V_{CE} = 5V	10	–	–	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 20A, I_B = 1A	–	–	2.2	V
		I_C = 50A, I_B = 10A	–	–	5.0	V
Base–Emitter Saturation Voltage	$V_{BE(sat)}$	I_C = 20A, I_B = 1A	–	–	2.75	V
Diode Forward Voltage	V_f	I_F = 20A, Note 3	–	2.5	5.0	V
Dynamic Characteristic						
Output Capacitance	C_{ob}	V_{CB} = 10V, I_E = 0, f_{test} = 100kHz	–	–	750	pF
Switching Characteristics						
Resistive Load						
Delay Time	t_d	V_{CC} = 250V, I_C = 20A, I_{B1} = 1A, $V_{BE(off)}$ = 5V, t_p = 25µs, Duty Cycle ≤ 2%	–	0.14	0.3	µs
Rise Time	t_r		–	0.3	1.0	µs
Storage Time	t_s		–	0.8	2.5	µs
Fall Time	t_f		–	0.3	1.0	µs
Inductive Load, Clamped						
Storage Time	t_{sv}	I_C = 20A(pk), V_{clamp} = 250V, I_{B1} = 1A, $V_{BE(off)}$ = 5V	–	1.0	2.5	µs
Crossover Time	t_c		–	0.36	1.0	µs

Note 2. Pulse Test: Pulse Widtg = 300µs, Duty Cycle ≤ 2%.

Note 3. The internal Collector–to–Emitter diode can eliminate the need for an external diode to clamp inductive loads. Tests have shown that the Forward Recovery Voltage (V_f) of this diode is comparable to that of typical fast recovery rectifiers.

Circuit Outline




.135 (3.45) Max
.350 (8.89)
.875 (22.2)
Dia Max
Seating
Plane
.312 (7.93) Min
.040 (1.02)
Emitter
1.187 (30.16)
.215 (5.45)
.665
(16.9)
.156 (3.96) Dia
(2 Holes)
.430
(10.92)
.188 (4.8) R Max
.525 (13.35) R Max
Base
Collector/Case