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# NTE53
# Silicon NPN Transistor
# High Voltage, High Speed Switch

**Description:**

The NTE52 is a silicon NPN 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 115V and 220V line–operated switch–mode appliations.

**Applications:**

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

**Absolute Maximum Ratings:**

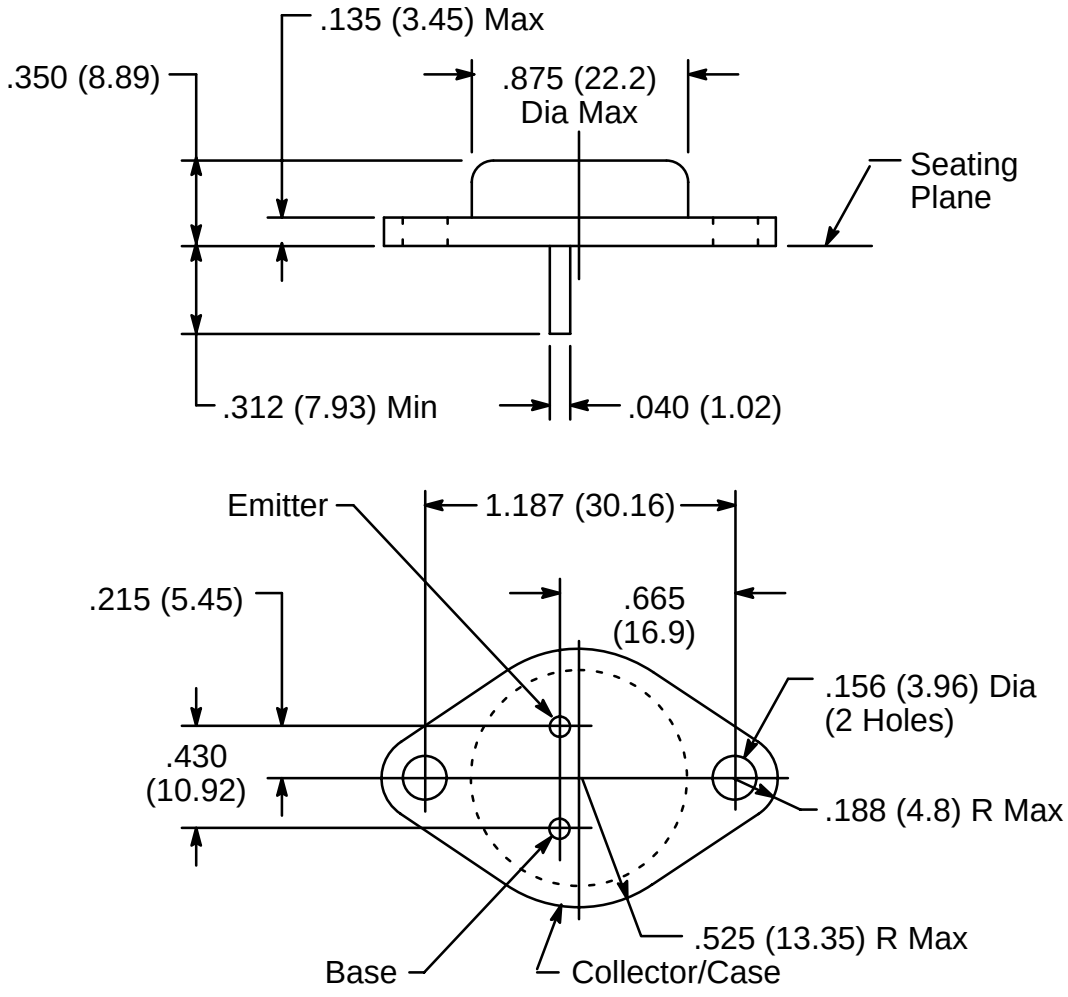
Collector–Emitter Voltage, $V_{CEO(sus)}$ . . . . . 400V
Collector–Emitter Voltage, $V_{CEX(sus)}$ . . . . . 450V
Collector–Emitter Voltage, $V_{CEV}$ . . . . . 850V
Emitter–Base Voltage, $V_{EB}$ . . . . . 9V
Collector Current, $I_C$
  Continuous . . . . . 15A
  Peak (Note 1) . . . . . 30A
Base Current, $I_B$
  Continuous . . . . . 10A
  Peak (Note 1) . . . . . 20A
Total Device Dissipation ($T_C$ = +25°C), $P_D$ . . . . . 175W
  Derate Above 25°C . . . . . 1.0W/°C
Total Device Dissipation ($T_C$ = +100°C), $P_D$ . . . . . 100W
Operating Junction Temperatur Range, $T_J$ . . . . . –65° to +200°C
Storage Temperatur Range, $T_{stg}$ . . . . . –65° to +200°C
Thermal Resistance, Junction–to–Case, $R_{thJC}$ . . . . . 1.0°C/W
Maximum Lead temperature (During Soldering, 1/8” from case, 5sec), $T_L$ . . . . . +275°C

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

**Electrical Charactetristics:** ($T_C$ = +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 | 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 = 300µs, Duty Cycle ≤ 2%.


.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