# NTE52
# 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 line–operated switch–mode appliations.

## Applications:

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

## Features:

- Fast Turn–Off Times:
  - 100ns Inductive Fall Time @ +25°C (Typ)
  - 150ns Inductive Crossover Time @ +25°C (Typ)
  - 400ns Inductive Storage Time @ +25°C (Typ)
- Operating Temperature Range: −65° to +200°C
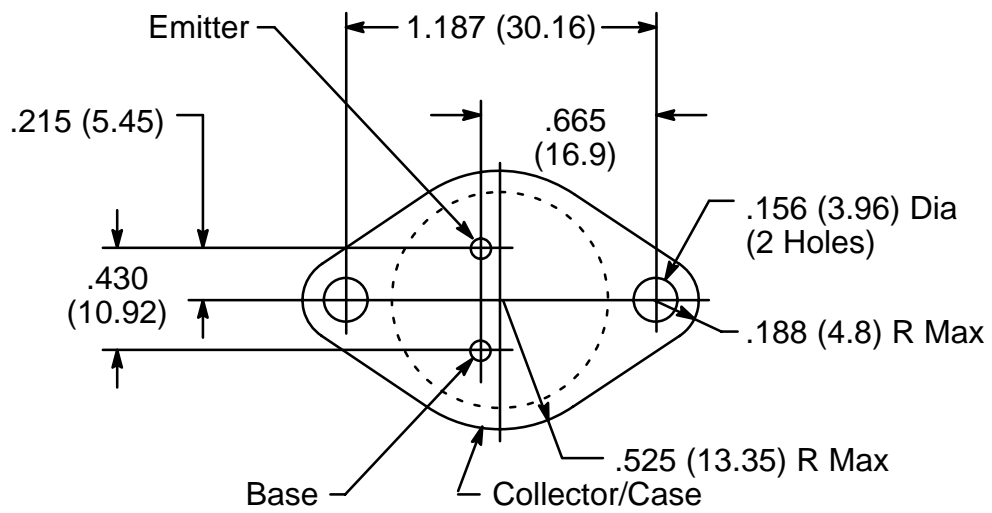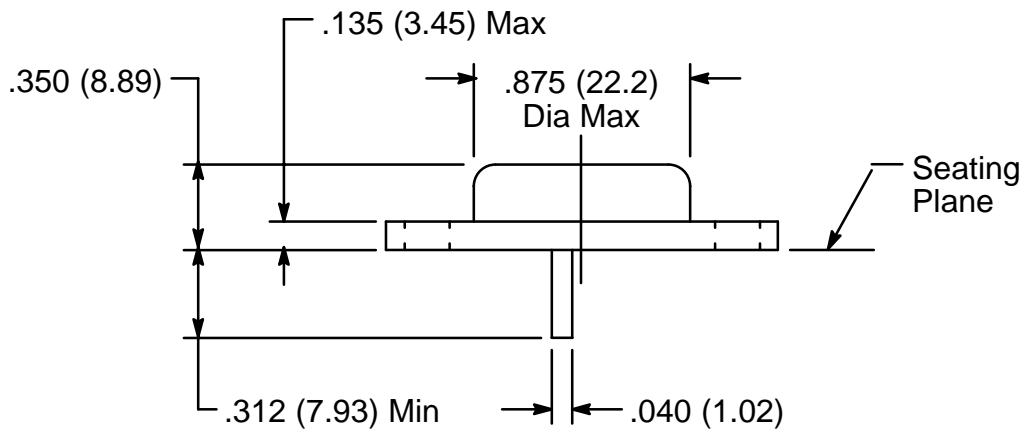
## Absolute Maximum Ratings:

Collector–Emitter Voltage, $V_{CEO(sus)}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 450V

Collector–Emitter Voltage, $V_{CEV}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 750V

Emitter–Base Voltage, $V_{EB}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 6V

Collector Current, $I_C$
    Continuous . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 5A
    Peak (Note 1) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 8A

Base Current, $I_B$
    Continuous . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2A
    Peak (Note 1) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 4A

Total Device Dissipation ($T_C$ = +25°C), $P_D$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 125W
    Derate Above 25°C . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0.714W/°C

Total Device Dissipation ($T_C$ = +100°C), $P_D$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 71.5W

Operating Junction Temperatur Range, $T_J$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . −65° to +200°C

Storage Temperatur Range, $T_{stg}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . −65° to +200°C

Thermal Resistance, Junction–to–Case, $R_{thJC}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1.4°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 | $V_{CEO(sus)}$ | $I_C = 100mA$, $I_B = 0$ | 450 | – | – | V |
| Collector Cutoff Current | $I_{CEV}$ | $V_{CEV} = 750V$, $V_{BE(off)} = 1.5V$ | – | – | 0.5 | mA |
| | | $V_{CEV} = 750V$, $V_{BE(off)} = 1.5V$, $T_C = +100°C$ | – | – | 2.5 | mA |
| | $I_{CER}$ | $V_{CEV} = 750V$, $R_{BE} = 50Ω$, $T_C = +100°C$ | – | – | 3.0 | mA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB} = 6V$, $I_C = 0$ | – | – | 1.0 | mA |
| **ON Characteristics** (Note 2) | | | | | | |
| DC Current Gain | $h_{FE}$ | $V_{CE} = 5V$, $I_C = 3A$ | 8 | – | – | |
| Collector–Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 3A$, $I_B = 0.6A$ | – | – | 1.0 | V |
| | | $I_C = 3A$, $I_B = 0.6A$, $T_C = +100°C$ | – | – | 2.0 | V |
| | | $I_C = 5A$, $I_B = 1A$ | – | – | 3.0 | V |
| Base–Emitter Saturation Voltage | $V_{BE(sat)}$ | $I_C = 3A$, $I_B = 0.6A$ | – | – | 1.5 | V |
| | | $I_C = 3A$, $I_B = 0.6A$, $T_C = +100°C$ | – | – | 1.5 | V |
| **Dynamic Characteristics** | | | | | | |
| Output Capacitance | $C_{ob}$ | $V_{CB} = 10V$, $I_E = 0$, $f = 1kHz$ | – | – | 250 | pF |
| **Switching Characteristics** (Resistive Load) | | | | | | |
| Delay Time | $t_d$ | $V_{CC} = 250V$, $I_C = 3A$, $I_{B1} = 0.4A$, $V_{BE(off)} = 5V$, $t_p = 300µs$, Duty Cycle $≤ 2\%$ | – | 0.03 | 0.05 | µs |
| Rise Time | $t_r$ | | – | 0.10 | 1.40 | µs |
| Storage Time | $t_s$ | | – | 0.40 | 0.50 | µs |
| Fall Time | $t_f$ | | – | 0.175 | 0.500 | µs |
| **Switching Characteristics** (Inductive Load, Clamped) | | | | | | |
| Storage Time | $t_{sv}$ | $I_C = 3A$ peak, $V_{clamp} = 250V$, $I_{B1} = 0.4A$, $V_{BE(off)} = 5V$ | – | 0.40 | – | µs |
| Crossover Time | $t_c$ | | – | 0.15 | – | µs |
| Fall Time | $t_{fi}$ | | – | 0.10 | – | µs |
| Storage Time | $t_{sv}$ | $I_C = 3A$ peak, $V_{clamp} = 250V$, $I_{B1} = 0.4A$, $V_{BE(off)} = 5V$, $T_J = +100°C$ | – | 0.70 | 2.0 | µs |
| Crossover Time | $t_c$ | | – | 0.28 | 0.50 | µs |
| Fall Time | $t_{fi}$ | | – | 0.15 | 0.30 | 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

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