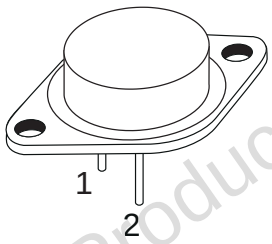
# BUT90

## HIGH POWER NPN SILICON TRANSISTOR

- NPN TRANSISTOR
- HIGH CURRENT CAPABILITY
- FAST SWITCHING SPEED
- HIGH RUGGEDNESS
- LOW COLLECTOR EMITTER SATURATION

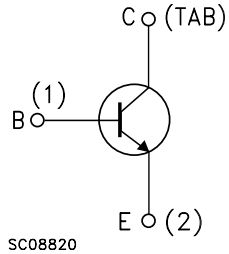
**APPLICATIONS**
- UNINTERRUPTABLE POWER SUPPLY
- MOTOR CONTROL
- LINEAR AND SWITCHING INDUSTRIAL EQUIPMENT

**DESCRIPTION**
The BUT90 is a Multiepitaxial Planar NPN Transistor in TO-3 package. It is intended for use in high frequency and efficency converters, switching regulators and motor control.




**TO-3**
(version "S")

**INTERNAL SCHEMATIC DIAGRAM**




Obsolete Product(s) - Obsolete Product(s)

**ABSOLUTE MAXIMUM RATINGS**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CEV}$ | Collector-Emitter Voltage ($V_{BE}$ = -1.5 V) | 200 | V |
| $V_{CEO}$ | Collector-Emitter Voltage ($I_B$ = 0) | 125 | V |
| $V_{EBO}$ | Emitter-Base Voltage ($I_C$ = 0) | 10 | V |
| $I_C$ | Collector Current | 50 | A |
| $I_{CM}$ | Collector Peak Current ($t_p$ = 10 ms) | 120 | A |
| $I_B$ | Base Current | 12 | A |
| $I_{BM}$ | Base Peak Current ($t_p$ = 10 ms) | 32 | A |
| $P_{tot}$ | Total Power Dissipation at $T_{case} \leq 25\ ^oC$ | 250 | W |
| $T_{stg}$ | Storage Temperature | -65 to 200 | $^oC$ |
| $T_j$ | Max Operating Junction Temperature | 200 | $^oC$ |

## THERMAL DATA

| | | | | |
|---|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-case | Max | 0.7 | $^oC/W$ |

## ELECTRICAL CHARACTERISTICS ($T_{case}$ = 25 $^oC$ unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CER}$ | Collector Cut-off Current ($R_{BE}$ = 10 Ω) | $V_{CE}$ = $V_{CEV}$<br>$V_{CE}$ = $V_{CEV}$ $T_c$ = 100 $^oC$ | | | 0.4<br>4 | mA<br>mA |
| $I_{CEV}$ | Collector Cut-off Current ($V_{BE}$ = -1.5V) | $V_{CE}$ = $V_{CEV}$<br>$V_{CE}$ = $V_{CEV}$ $T_c$ = 100 $^oC$ | | | 0.2<br>2 | mA<br>mA |
| $I_{EBO}$ | Emitter Cut-off Current ($I_C$ = 0) | $V_{EB}$ = 7 V | | | 1 | mA |
| $V_{CEO(sus)}$* | Collector-Emitter Sustaining Voltage ($I_B$ = 0) | $I_C$ = 0.2 A L = 25 mH | 125 | | | V |
| $V_{EBO}$ | Emitter-Base Voltage ($I_C$ = 0) | $I_E$ = 50 mA | 10 | | | V |
| $V_{CE(sat)}$* | Collector-Emitter Saturation Voltage | $I_C$ = 35 A $I_B$ = 1.75 A<br>$I_C$ = 70 A $I_B$ = 7 A<br>$I_C$ = 35 A $I_B$ = 1.75 A $T_c$ = 100 $^oC$<br>$I_C$ = 70 A $I_B$ = 7 A $T_c$ = 100 $^oC$ | | 0.55<br>0.8<br>0.75<br>1.2 | 0.9<br>0.9<br>1.2<br>1.5 | V<br>V<br>V<br>V |
| $V_{BE(sat)}$* | Base-Emitter Saturation Voltage | $I_C$ = 35 A $I_B$ = 1.75 A<br>$I_C$ = 70 A $I_B$ = 7 A<br>$I_C$ = 35 A $I_B$ = 1.75 A $T_c$ = 100 $^oC$<br>$I_C$ = 70 A $I_B$ = 7 A $T_c$ = 100 $^oC$ | | 1<br>1.45<br>1<br>1.65 | 1.3<br>1.8<br>1.4<br>2 | V<br>V<br>V<br>V |

RESISTIVE LOAD

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_r$<br>$t_s$<br>$t_f$ | Rise Time<br>Storage Time<br>Fall Time | $V_{CC}$ = 100 V $I_c$ = 70 A<br>$I_{B1}$ = - $I_{B2}$ = 7 A $t_p$ = 30 µs | | 0.8<br>0.9<br>0.2 | 1.2<br>1.5<br>0.4 | µs<br>µs<br>µs |
| $t_r$<br>$t_s$<br>$t_f$ | Rise Time<br>Storage Time<br>Fall Time | $V_{CC}$ = 100 V $I_c$ = 70 A<br>$I_{B1}$ = - $I_{B2}$ = 7 A $t_p$ = 30 µs<br>$T_j$ = 100 $^oC$ | | 1.1<br>1.2<br>0.3 | 1.6<br>2<br>0.6 | µs<br>µs<br>µs |

INDUCTIVE LOAD

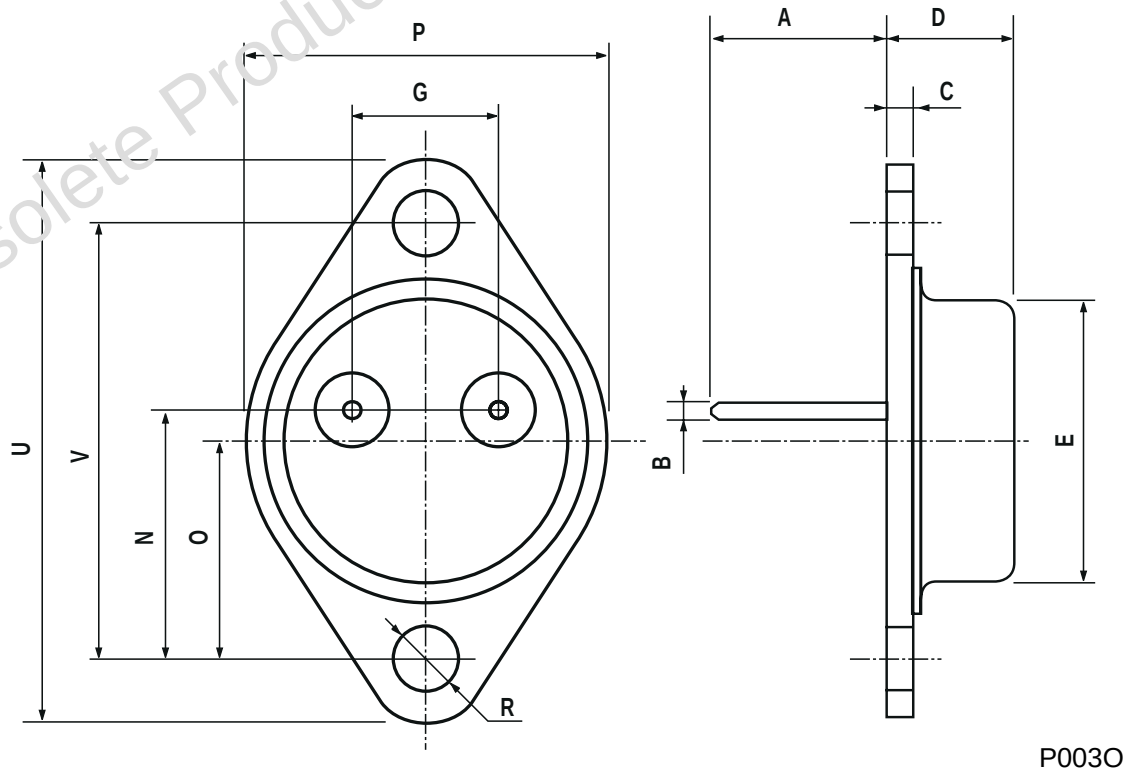
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_s$<br>$t_f$ | Storage Time<br>Fall Time | $V_{CC}$ = 100 V $V_{Clamp}$ = 125 V<br>$I_C$ = 70 A $I_{B1}$ = - $I_{B2}$ = 7 A<br>$L_C$ = 70 µH | | 1.25<br>0.16 | 2<br>0.3 | ms<br>µs |
| $t_s$<br>$t_f$ | Storage Time<br>Fall Time | $V_{CC}$ = 100 V $V_{Clamp}$ = 125 V<br>$I_C$ = 70 A $I_{B1}$ = - $I_{B2}$ = 7 A<br>$L_C$ = 70 µH $T_j$ = 100 $^oC$ | | 1.5<br>0.25 | 2.3<br>0.5 | µs<br>µs |

* Pulsed : Pulse duration = 300 µs, duty cycle = 2%

Obsolete Product(s) - Obsolete Product(s)

## TO-3 (version S) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 11.00 | | 13.10 | 0.433 | | 0.516 |
| B | 1.47 | | 1.60 | 0.058 | | 0.063 |
| C | 1.50 | | 1.65 | 0.059 | | 0.065 |
| D | 8.32 | | 8.92 | 0.327 | | 0.351 |
| E | 19.00 | | 20.00 | 0.748 | | 0.787 |
| G | 10.70 | | 11.10 | 0.421 | | 0.437 |
| N | 16.50 | | 17.20 | 0.649 | | 0.677 |
| P | 25.00 | | 26.00 | 0.984 | | 1.023 |
| R | 4.00 | | 4.09 | 0.157 | | 0.161 |
| U | 38.50 | | 39.30 | 1.515 | | 1.547 |
| V | 30.00 | | 30.30 | 1.187 | | 1.193 |

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