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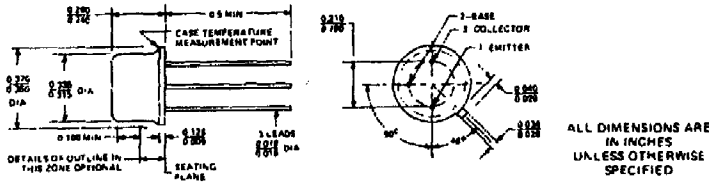
# 2N3036
# NPN Silicon Transistor

**FOR GENERAL PURPOSE, MEDIUM-POWER AMPLIFIER AND SWITCHING APPLICATIONS**

- **High Power Dissipation Capability: 10 w at $T_C$ = 25°C**
- **High Breakdown Voltage Combined with Very Low Saturation Voltage**
- **DC Beta Guaranteed From 100 μa to 1 amp**

**mechanical data**

THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE CASE




ALL JEDEC TO-39 DIMENSIONS AND NOTES ARE APPLICABLE*

**absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)**

| | |
|---|---|
| Collector-Base Voltage | 120 v* |
| Collector-Emitter Voltage (See Note 1) | 80 v* |
| Emitter-Base Voltage | 7 v* |
| Continuous Collector Current | 1.2 a* |
| Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 2) | 0.8 w* |
| Continuous Device Dissipation at (or below) 25°C Case Temperature (See Note 3) | 10 w<br>5 w* |
| Storage Temperature Range | −65°C to 200°C* |
| Lead Temperature ⅛ Inch from Case for 10 Seconds | 300°C* |

***electrical characteristics at 25°C free-air temperature (unless otherwise noted)**

| PARAMETER | | TEST CONDITIONS | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C$ = 100 μa, $I_E$ = 0 | 120 | | v |
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage | $I_C$ = 30 ma, $I_B$ = 0, (See Note 4) | 80 | | v |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E$ = 100 μa, $I_C$ = 0 | 7 | | v |
| $I_{CBO}$ | Collector Cutoff Current | $V_{CB}$ = 60 v, $I_E$ = 0 | | 10 | na |
| | | $V_{CB}$ = 60 v, $I_E$ = 0, $T_A$ = 150°C | | 10 | μa |
| $I_{EBO}$ | Emitter Cutoff Current | $V_{EB}$ = 5 v, $I_C$ = 0 | | 10 | na |
| $h_{FE}$ | Static Forward Current Transfer Ratio | $V_{CE}$ = 10 v, $I_C$ = 100 μa | 20 | | |
| | | $V_{CE}$ = 10 v, $I_C$ = 10 ma | 40 | | |
| | | $V_{CE}$ = 10 v, $I_C$ = 150 ma, (See Note 4) | 50 | 150 | |
| | | $V_{CE}$ = 10 v, $I_C$ = 500 ma, (See Note 4) | 25 | | |
| | | $V_{CE}$ = 10 v, $I_C$ = 1 a, (See Note 4) | 15 | | |
| | | $V_{CE}$ = 1 v, $I_C$ = 150 ma, (See Note 4) | 30 | | |
| $V_{BE}$ | Base-Emitter Voltage | $I_B$ = 15ma, $I_C$ = 150 ma, (See Note 4) | 0.75 | 1.1 | v |
| | | $I_B$ = 50 ma, $I_C$ = 500 ma, (See Note 4) | | 1.5 | v |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_B$ = 15 ma, $I_C$ = 150 ma, (See Note 4) | | 0.25 | v |
| | | $I_B$ = 50 ma, $I_C$ = 500 ma, (See Note 4) | | 1.0 | v |

NOTES: 1. This value applies when the base-emitter diode is open-circuited.
2. Derate linearly to 200°C free-air temperature at the rate of 4.57 mw/°C.
3. Derate the 10-watt rating linearly to 200°C case temperature at the rate of 57.1 mw/°C.
Derate the 5-watt (JEDEC registered) rating linearly to 200°C case temperature at the rate of 28.6 mw/°C.
4. These parameters must be measured using pulse techniques. PW = 300 μs, Duty Cycle ≤ 2%.

*The JEDEC registered outline for these devices is TO-5. TO-39 falls within TO-5 with the exception of lead length.
*JEDEC registered data. This data sheet contains all applicable registered data in effect at the time of publication.

## *electrical characteristics at 25°C free-air temperature

| PARAMETER | | TEST CONDITIONS | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $h_{ie}$ | Small-Signal Common-Emitter Input Impedance | $V_{CE} = 10$ v, $I_C = 10$ ma, $f = 1$ kc | 120 | 900 | ohm |
| $h_{fe}$ | Small-Signal Common-Emitter Forward Current Transfer Ratio | $V_{CE} = 10$ v, $I_C = 10$ ma, $f = 1$ kc | 40 | 180 | |
| $h_{oe}$ | Small-Signal Common-Emitter Output Admittance | $V_{CE} = 10$ v, $I_C = 10$ ma, $f = 1$ kc | | 120 | $\mu$mho |
| $\lvert h_{fe} \rvert$ | Small-Signal Common-Emitter Forward Current Transfer Ratio | $V_{CE} = 10$ v, $I_C = 10$ ma, $f = 20$ mc | 2.5 | | |
| $C_{ob}$ | Common-Base Open-Circuit Output Capacitance | $V_{CB} = 10$ v, $I_E = 0$, $f = 1$ mc | | 15 | pf |
| $C_{ib}$ | Common-Base Open-Circuit Input Capacitance | $V_{EB} = 0.5$ v, $I_C = 0$, $f = 1$ mc | | 85 | pf |

## *switching characteristics at 25°C free-air temperature

| PARAMETER | | TEST CONDITIONS † | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $t_d$ | Delay Time | $I_C = 150$ ma, $I_{B(1)} = 15$ ma, $I_{B(2)} = -15$ ma, $V_{BE(off)} = -2.75$ v, $R_L = 40\ \Omega$, (See Figure 1) | | 30 | nsec |
| $t_r$ | Rise Time | | | 150 | nsec |
| $t_s$ | Storage Time | | | 1 | $\mu$sec |
| $t_f$ | Fall Time | | | 200 | nsec |

†Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.