

HIGH-POWER NPN SILICON TRANSISTORS

... designed for use in industrial power amplifiers and switching circuit applications.

FEATURES:

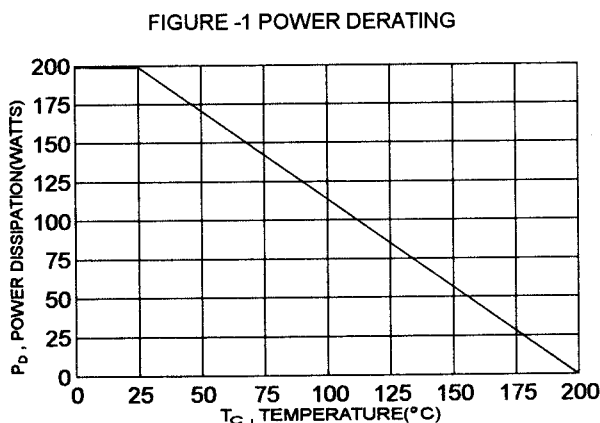
- * High DC Current Gain
 $h_{FE}=30-120 @ I_C=10A$
 $=12 \text{ (Min)} @ I_C=25A$
- * Low Collector-Emitter Saturation Voltage
 $V_{CE(SAT)} = 1.0V \text{ (Max.)} @ I_C = 10 A, I_B = 1.0A$
- * Complement to 2N6436-38

MAXIMUM RATINGS

| Characteristic | Symbol | 2N6338 | 2N6339 | 2N6340 | 2N6341 | Unit |
|---|----------------|-------------|--------|--------|--------|--------------------|
| Collector-Emitter Voltage | V_{CEO} | 100 | 120 | 140 | 150 | V |
| Collector-Base Voltage | V_{CBO} | 120 | 140 | 160 | 180 | V |
| Emitter-Base Voltage | V_{EBO} | 6.0 | | | | V |
| Collector Current-Continuous -Peak | I_C | 25 50 | | | | A |
| Base Current | I_B | 10 | | | | A |
| Total Power Dissipation @ $T_C=25^\circ C$ Derate above $25^\circ C$ | P_D | 200 1.14 | | | | W W/ $^\circ C$ |
| Operating and Storage Junction Temperature Range | T_J, T_{STG} | -65 to +200 | | | | $^\circ C$ |

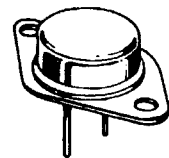
THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|-------------------------------------|-----------------|-------|--------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 0.875 | $^\circ C/W$ |

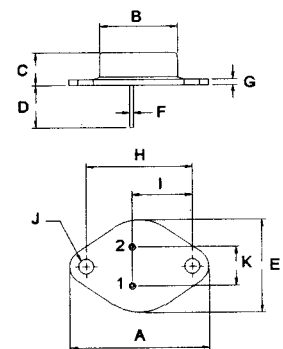


NPN
2N6338
2N6339
2N6340
2N6341

25 AMPERE
POWER TRANSISTOR
NPN SILICON
100-150 VOLTS
200 WATTS



TO-3



PIN 1.BASE
 2.EMITTER
 COLLECTOR (CASE)

| DIM | MILLIMETERS | |
|-----|-------------|-------|
| | MIN | MAX |
| A | 38.75 | 39.96 |
| B | 19.28 | 22.23 |
| C | 7.96 | 9.28 |
| D | 11.18 | 12.19 |
| E | 25.20 | 26.67 |
| F | 0.92 | 1.09 |
| G | 1.38 | 1.62 |
| H | 29.90 | 30.40 |
| I | 16.64 | 17.30 |
| J | 3.88 | 4.36 |
| K | 10.67 | 11.18 |

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | |
|--|--------------------------------------|---------------|--------------------------|---------------|
| Collector -Emitter Sustaining Voltage (1) ($I_c = 50\text{mA}$, $I_B = 0$) | 2N6338 2N6339 2N6340 2N6341 | $V_{CE(sus)}$ | 100 120 140 150 | V |
| Collector Cutoff Current ($V_{CE} = 50\text{V}$, $I_B = 0$) ($V_{CE} = 60\text{V}$, $I_B = 0$) ($V_{CE} = 70\text{V}$, $I_B = 0$) ($V_{CE} = 75\text{V}$, $I_B = 0$) | 2N6338 2N6339 2N6340 2N6341 | I_{CEO} | 50 50 50 50 | μA |
| Collector Cutoff Current ($V_{CB} = \text{Rated } V_{CB}$, $I_E = 0$) | | I_{CBO} | 10 | μA |
| Emitter Cutoff Current ($V_{EB} = 6.0\text{V}$, $I_C = 0$) | | I_{EBO} | 100 | μA |

ON CHARACTERISTICS (1)

| | | | | | |
|---|--|---------------|----------------|------------|---|
| DC Current Gain ($I_c = 0.5\text{A}$, $V_{CE} = 2.0\text{V}$) ($I_c = 10\text{A}$, $V_{CE} = 2.0\text{V}$) ($I_c = 25\text{A}$, $V_{CE} = 2.0\text{V}$) | | h_{FE} | 50 30 12 | 120 | |
| Collector-Emitter Saturation Voltage ($I_c = 10\text{A}$, $I_B = 1.0\text{A}$) ($I_c = 25\text{A}$, $I_B = 2.5\text{A}$) | | $V_{CE(sat)}$ | | 1.0 1.8 | V |
| Base-Emitter Saturation Voltage ($I_c = 10\text{A}$, $I_B = 1.0\text{A}$) ($I_c = 25\text{A}$, $I_B = 2.5\text{A}$) | | $V_{BE(sat)}$ | | 1.8 2.5 | V |
| Base-Emitter On Voltage ($I_c = 10\text{A}$, $V_{CE} = 2.0\text{V}$) | | $V_{BE(on)}$ | | 1.8 | V |

DYNAMIC CHARATERISTICS

| | | | | | |
|--|--|----------|----|-----|-----|
| Current-Gain Bandwidth Product (2) ($I_c = 1.0\text{A}$, $V_{CE} = 10\text{V}$, $f = 10\text{MHz}$) | | f_T | 40 | | MHz |
| Output Capacitance ($V_{CB} = 10\text{V}$, $I_E = 0$, $f = 0.1\text{MHz}$) | | C_{ob} | | 300 | pF |

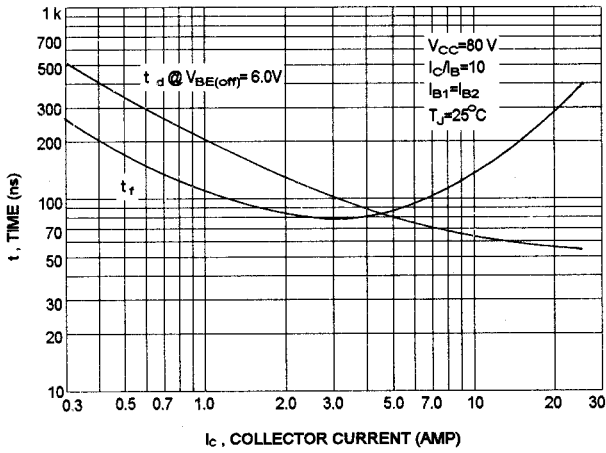
SWTCHING CHARACTERISTICS

| | | | | |
|--------------|---|-------|-----|---------------|
| Rise Time | $V_{CC} = 80\text{V}$, $I_c = 10\text{A}$ $I_{B1} = -I_{B2} = 1\text{A}$ $V_{BE(off)} = 6\text{V}$ | t_r | 0.4 | μs |
| Storage Time | | t_s | 1.5 | μs |
| Fall Time | | t_f | 0.6 | μs |

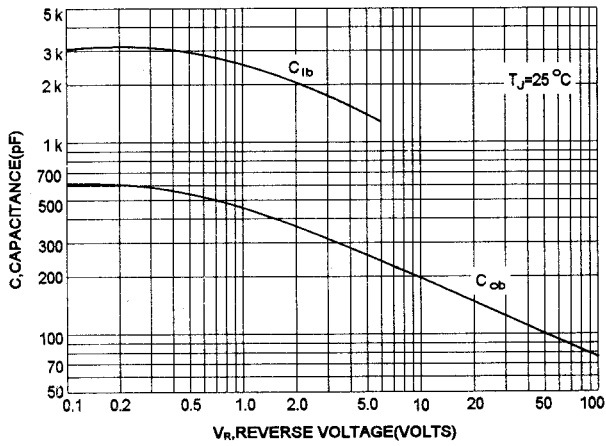
(1) Pulse Test: Pulse width = $300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$

(2) $f_T = |h_{fe}| \cdot f_{test}$

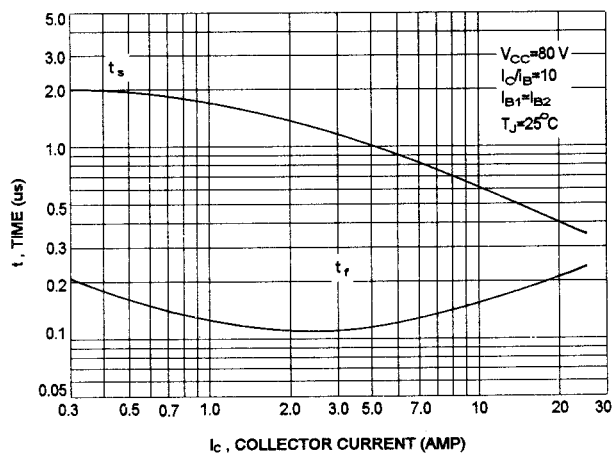
TURN-ON TIME



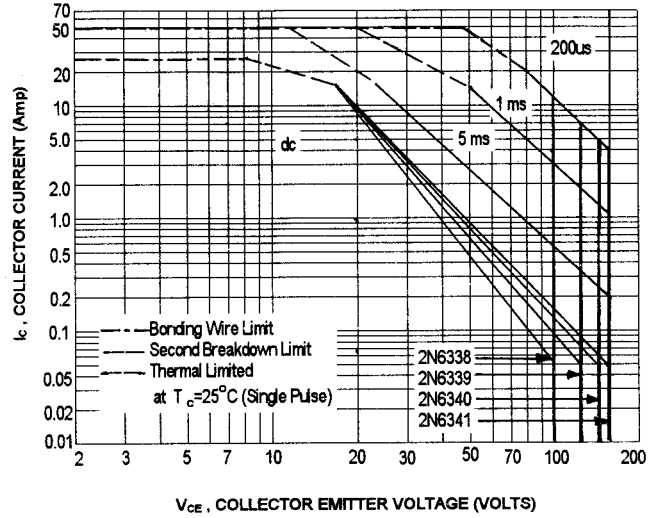
CAPACITANCES



TURN-OFF TIME



ACTIVE-REGION SAFE OPERATING AREA (SOA)



There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of SOA curve is base on $T_{J(PK)} = 200^\circ C$; T_c is variable depending on conditions. second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)} \leq 200^\circ C$. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.



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