# 2N5346 (SILICON)
thru
# 2N5349

## MEDIUM-POWER NPN SILICON TRANSISTORS

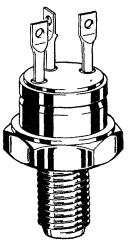
. . . designed for switching and wide-band amplifier applications.

- Low Collector-Emitter Saturation Voltage – $V_{CE(sat)}$ = 1.2 Vdc (Max) @ $I_C$ = 7.0 Adc
- DC Current Gain Specified to 5 Amperes
- Excellent Safe Operating Area
- Packaged in the Compact, High Dissipation TO-59 Case
- Isolated Collector Configuration

## 7 AMPERE POWER TRANSISTORS

## NPN SILICON

**80-100 VOLTS**
**60 WATTS**



*MAXIMUM RATINGS

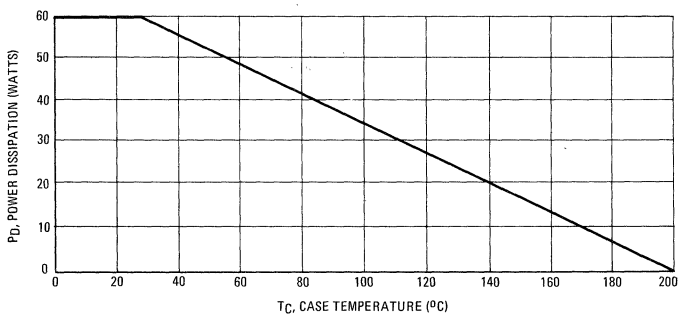
| Rating | Symbol | 2N5346 2N5347 | 2N5348 2N5349 | Unit |
|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 80 | 100 | Vdc |
| Collector-Base Voltage | $V_{CB}$ | 80 | 100 | Vdc |
| Emitter-Base Voltage | $V_{EB}$ | 6.0 | | Vdc |
| Collector Current – Continuous | $I_C$ | 7.0 | | Adc |
| Base Current | $I_B$ | 1.0 | | Adc |
| Total Device Dissipation @ $T_C$ = 25°C | $P_D$ | 60 | | Watts |
| Derate above 25°C | | 343 | | mW/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | -65 to +200 | | °C |

THERMAL CHARACTERISTICS

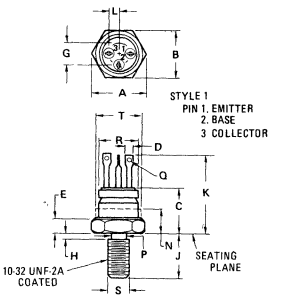
| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $\theta_{JC}$ | 2.91 | °C/W |

*Indicates JEDEC Registered Data

FIGURE 1 – POWER-TEMPERATURE DERATING CURVE




Safe Area Curves are indicated by Figure 5. All limits are applicable and must be observed.




| DIM | MILLIMETERS MIN | MILLIMETERS MAX | INCHES MIN | INCHES MAX |
|---|---|---|---|---|
| B | 10.77 | 11.10 | 0.424 | 0.437 |
| C | 8.13 | 11.89 | 0.320 | 0.468 |
| E | 2.29 | 3.81 | 0.090 | 0.150 |
| G | 4.70 | 5.46 | 0.185 | 0.215 |
| H | – | 1.98 | – | 0.078 |
| J | 10.16 | 11.56 | 0.400 | 0.455 |
| K | 14.48 | 19.38 | 0.570 | 0.763 |
| L | 2.29 | 2.79 | 0.090 | 0.110 |
| N | – | 6.35 | – | 0.250 |
| P | 4.14 | 4.80 | 0.163 | 0.189 |
| Q | 1.02 | 1.65 | 0.040 | 0.065 |
| R | 8.08 | 9.65 | 0.318 | 0.380 |
| S | 4.212 | 4.310 | 0.1658 | 0.1697 |
| T | 9.65 | 11.10 | 0.380 | 0.437 |

All JEDEC dimensions and notes apply
Collector isolated from case.

CASE 160-03
TO-59

ISOLATED COLLECTOR

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

| Characteristic | | Fig. No. | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Emitter Sustaining Voltage (1) ($I_C$ = 50 mAdc, $I_B$ = 0) | 2N5346, 2N5347<br>2N5348, 2N5349 | - | $V_{CEO(sus)}$ | 80<br>100 | -<br>- | Vdc |
| Collector Cutoff Current<br>($V_{CE}$ = 75 Vdc, $I_B$ = 0)<br>($V_{CE}$ = 90 Vdc, $I_B$ = 0) | 2N5346, 2N5347<br>2N5348, 2N5349 | - | $I_{CEO}$ | -<br>- | 100<br>100 | μAdc |
| Collector Cutoff Current<br>($V_{CE}$ = 75 Vdc, $V_{EB(off)}$ = 1.5 Vdc)<br>($V_{CE}$ = 90 Vdc, $V_{EB(off)}$ = 1.5 Vdc)<br>($V_{CE}$ = 75 Vdc, $V_{EB(off)}$ = 1.5 Vdc, $T_C$ = 150°C)<br>($V_{CE}$ = 90 Vdc, $V_{EB(off)}$ = 1.5 Vdc, $T_C$ = 150°C) | 2N5346, 2N5347<br>2N5348, 2N5349<br>2N5346, 2N5347<br>2N5348, 2N5349 | 12 | $I_{CEX}$ | -<br>-<br>-<br>- | 10<br>10<br>1.0<br>1.0 | μAdc<br><br>mAdc<br> |
| Collector Cutoff Current<br>($V_{CB}$ = Rated $V_{CB}$, $I_E$ = 0) | | - | $I_{CBO}$ | - | 10 | μAdc |
| Emitter Cutoff Current<br>($V_{EB}$ = 6.0 Vdc, $I_C$ = 0) | | - | $I_{EBO}$ | - | 100 | μAdc |
| **ON CHARACTERISTICS (1)** | | | | | | |
| DC Current Gain<br>($I_C$ = 500 mAdc, $V_{CE}$ = 2.0 Vdc)<br><br>($I_C$ = 2.0 Adc, $V_{CE}$ = 2.0 Vdc)<br><br>($I_C$ = 5.0 Adc, $V_{CE}$ = 2.0 Vdc) | 2N5346, 2N5348<br>2N5347, 2N5349<br>2N5346, 2N5348<br>2N5347, 2N5349<br>2N5346, 2N5348<br>2N5347, 2N5349 | 8 | $h_{FE}$ | 30<br>60<br>30<br>60<br>20<br>40 | -<br>-<br>120<br>240<br>-<br>- | - |
| Collector-Emitter Saturation Voltage<br>($I_C$ = 2.0 Adc, $I_B$ = 0.2 Adc)<br>($I_C$ = 7.0 Adc, $I_B$ = 0.7 Adc) | | 9,11,13 | $V_{CE(sat)}$ | -<br>- | 0.7<br>1.2 | Vdc |
| Base-Emitter Saturation Voltage<br>($I_C$ = 2.0 Adc, $I_B$ = 0.2 Adc)<br>($I_C$ = 7.0 Adc, $I_B$ = 0.7 Adc) | | 11, 13 | $V_{BE(sat)}$ | -<br>- | 1.2<br>2.0 | Vdc |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Current-Gain—Bandwidth Product<br>($I_C$ = 500 mAdc, $V_{CE}$ = 10 Vdc, f = 10 MHz) | | - | $f_T$ | 30 | - | MHz |
| Output Capacitance<br>($V_{CB}$ = 10 Vdc, $I_E$ = 0, f = 100 kHz) | | 7 | $C_{ob}$ | - | 250 | pF |
| Input Capacitance<br>($V_{BE}$ = 2.0 Vdc, $I_C$ = 0, f = 100 kHz) | | 7 | $C_{ib}$ | - | 1,000 | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Delay Time | ($V_{CC}$ = 40 Vdc, $V_{EB(off)}$ = 3.0 Vdc, | 2,3 | $t_d$ | - | 100 | ns |
| Rise Time | $I_C$ = 2.0 Adc, $I_{B1}$ = 200 mAdc) | | $t_r$ | - | 100 | ns |
| Storage Time | ($V_{CC}$ = 40 Vdc, $I_C$ = 2.0 Adc, | 2,6 | $t_s$ | - | 2.0 | μs |
| Fall Time | $I_{B1}$ = $I_{B2}$ = 200 mAdc) | | $t_f$ | - | 200 | ns |

*Indicates JEDEC Registered Data.
(1)Pulse Test: Pulse Width ≈ 300 μs, Duty Cycle ≈ 2.0%.

**FIGURE 2 – SWITCHING TIME TEST CIRCUIT**

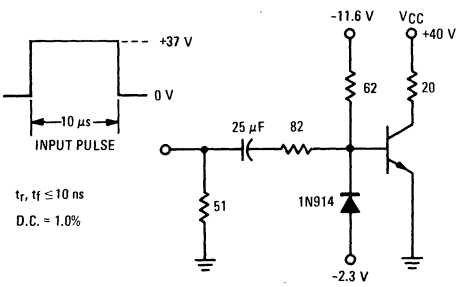



**FIGURE 3 – TURN-ON TIME**

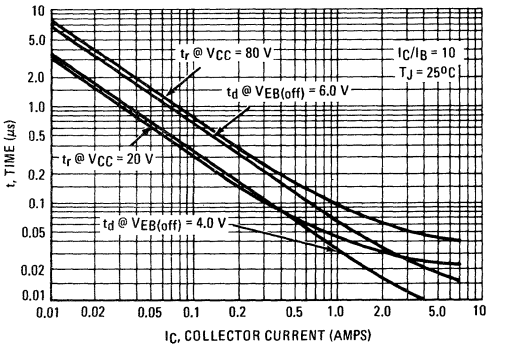


FIGURE 4 – THERMAL RESPONSE

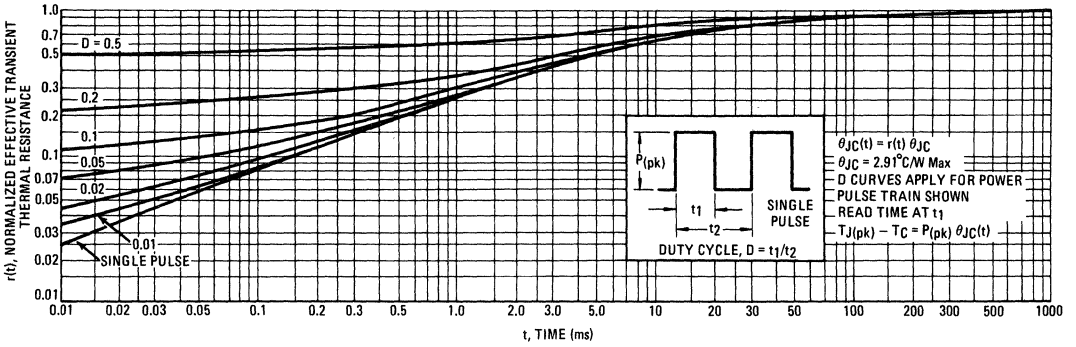
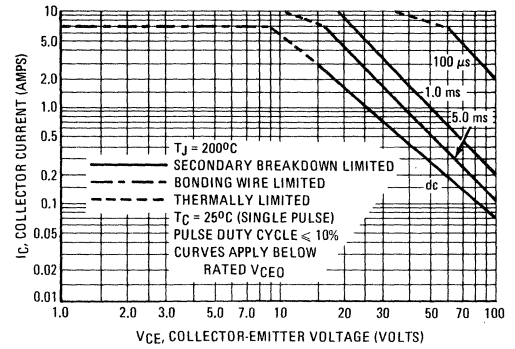



FIGURE 5 – ACTIVE-REGION SAFE OPERATING AREA




There are two limitations on the power handling ability of a transistor: junction temperature and secondary 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 the curves indicate.

The data of Figure 5 is based on $T_{J(pk)} = 200^{\circ}C$; $T_C$ is variable depending on conditions. Pulse curves are valid for duty cycles of 10% provided $T_{J(pk)} \leq 200^{\circ}C$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

FIGURE 6 – TURN-OFF TIME

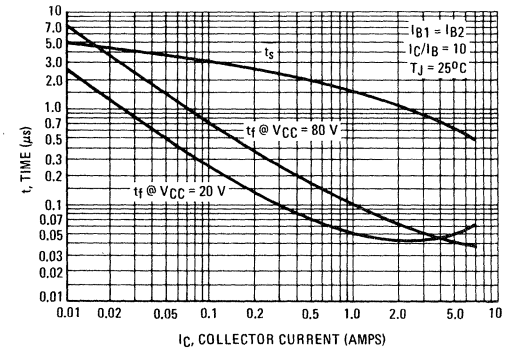



FIGURE 7 – CAPACITANCE versus VOLTAGE

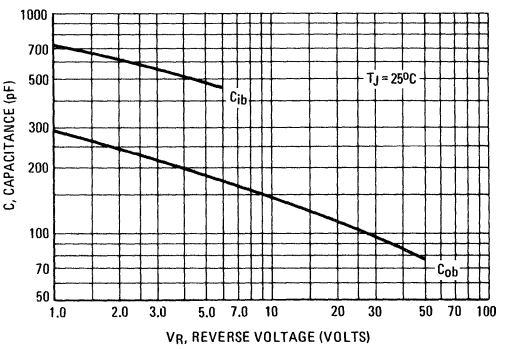


FIGURE 8 – DC CURRENT GAIN

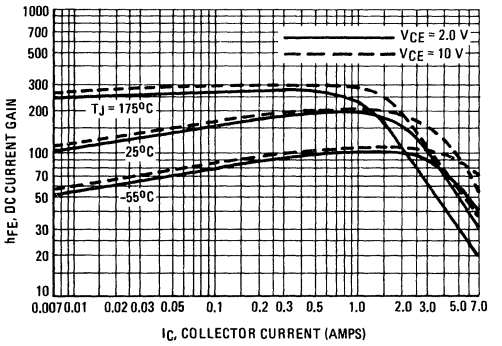



FIGURE 9 – COLLECTOR SATURATION REGION

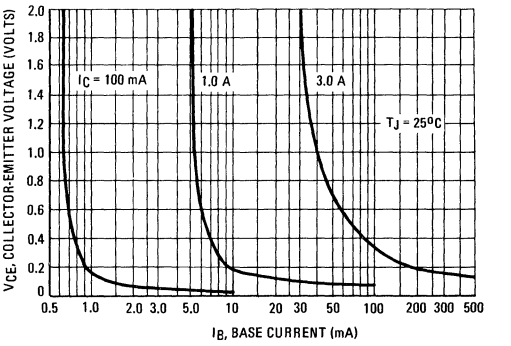



FIGURE 10 – EFFECTS OF BASE-EMITTER RESISTANCE

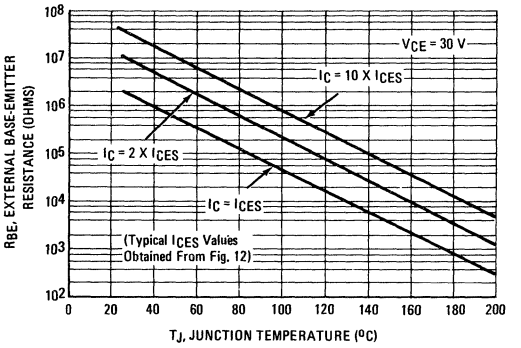



FIGURE 11 – "ON" VOLTAGES

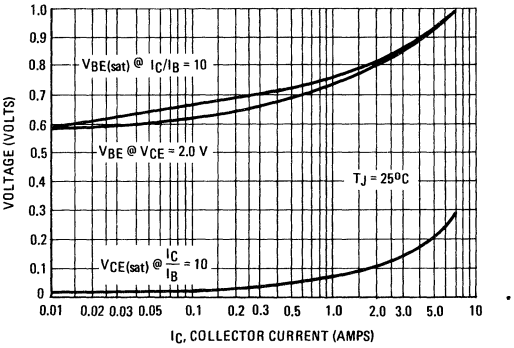



FIGURE 12 – COLLECTOR CUT-OFF REGION

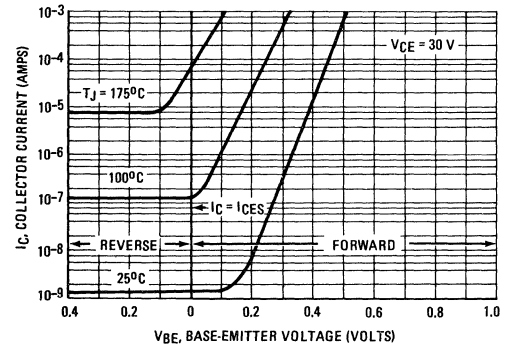



FIGURE 13 – TEMPERATURE COEFFICIENTS