

# Silicon NPN High-Power Transistor

... designed for general-purpose power amplifier and switching applications.

- Collector–Emitter Sustaining Voltage —  
 $V_{CEO(sus)} = 80 \text{ Vdc (Min)}$
- DC Current Gain —  
 $h_{FE} = 20 \text{ (Min) @ } I_C = 6.0 \text{ Adc}$
- Low Collector — Emitter Saturation Voltage —  
 $V_{CE(sat)} = 1.0 \text{ Vdc (Max) @ } I_C = 7.0 \text{ Adc}$
- High Current — Gain–Bandwidth Product —  
 $f_T = 4.0 \text{ MHz (Min) @ } I_C = 1.0 \text{ Adc}$

## MAXIMUM RATINGS (1)

Rating	Symbol	Max	Unit
Collector–Emitter Voltage	$V_{CEO}$	80	Vdc
Collector–Base Voltage	$V_{CB}$	80	Vdc
Emitter–Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current — Continuous Peak	$I_C$	15 30	A dc
Base Current	$I_B$	5.0	A dc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	160 0.915	Watts $\text{W}/^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200	$^\circ\text{C}$

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	1.1	$^\circ\text{C}/\text{W}$

(1) Indicates JEDEC registered data. Units and conditions differ on some parameters and re-registration reflecting these changes has been requested. All above values meet or exceed present JEDEC registered data.

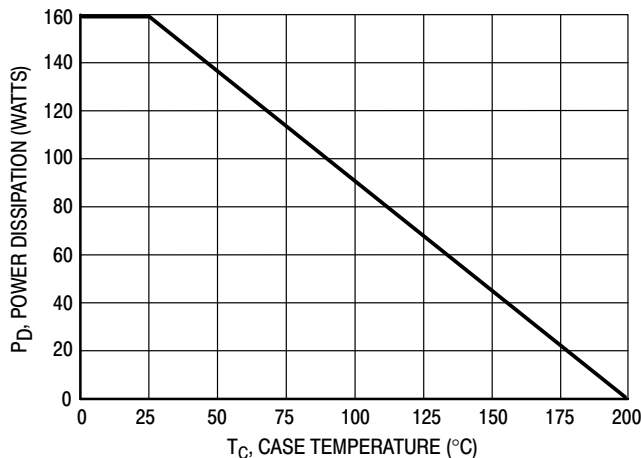


Figure 1. Power Derating

**2N5882**  
ON Semiconductor Preferred Device

**15 AMPERE  
SILICON  
POWER TRANSISTOR  
80 VOLTS  
160 WATTS**

**CASE 1-07  
TO-204AA  
(TO-3)**

Preferred devices are ON Semiconductor recommended choices for future use and best overall value.

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (2) ( $I_C = 200\text{ mAdc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	80	—	Vdc
Collector Cutoff Current ( $V_{CE} = 40\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	—	1.0	mAdc
Collector Cutoff Current ( $V_{CE} = 80\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 80\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )	$I_{CEX}$	—	0.5 5.0	mAdc
Collector Cutoff Current ( $V_{CB} = 80\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	0.5	mAdc
Emitter Cutoff Current ( $V_{EB} = 5.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	1.0	mAdc

**ON CHARACTERISTICS**

DC Current Gain (1) ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 6.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 15\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )	$h_{FE}$	35 20 4.0	— 100 —	—
Collector–Emitter Saturation Voltage (2) ( $I_C = 7.0\text{ Adc}$ , $I_B = 0.7\text{ Adc}$ ) ( $I_C = 15\text{ Adc}$ , $I_B = 3.75\text{ Adc}$ )	$V_{CE(sat)}$	— —	1.0 4.0	Vdc
Base–Emitter Saturation Voltage (1) ( $I_C = 15\text{ Adc}$ , $I_B = 3.75\text{ Adc}$ )	$V_{BE(sat)}$	—	2.5	Vdc
Base–Emitter On Voltage (2) ( $I_C = 6.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )	$V_{BE(on)}$	—	1.5	Vdc

**DYNAMIC CHARACTERISTICS**

Current–Gain — Bandwidth Product (3) ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 1.0\text{ MHz}$ )	$f_T$	4.0	—	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 100\text{ kHz}$ )	$C_{ob}$	—	400	pF
Small–Signal Current Gain ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	20	—	—

**SWITCHING CHARACTERISTICS**

Rise Time	$(V_{CC} = 30\text{ Vdc}$ , $I_C = 6.0\text{ Adc}$ , $I_{B1} = I_{B2} = 0.6\text{ Adc}$ See Figure 2)	$t_r$	—	0.7	$\mu\text{s}$
Storage Time		$t_s$	—	1.0	$\mu\text{s}$
Fall Time		$t_f$	—	0.8	$\mu\text{s}$

\*Indicates JEDEC Registered Data.

(2) Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

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

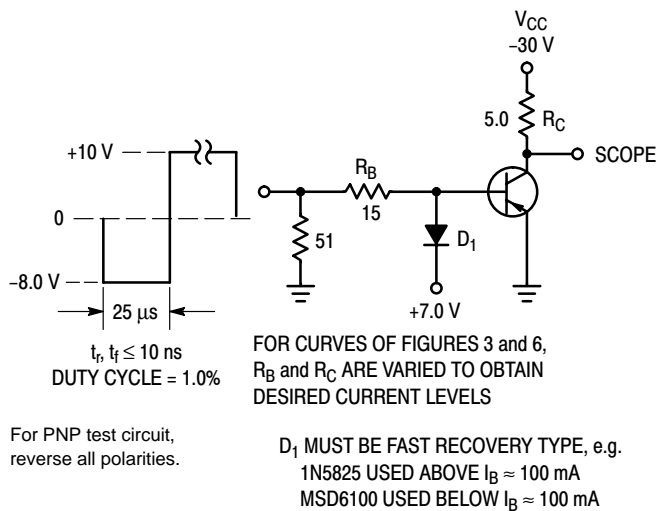


Figure 2. Switching Times Test Circuit

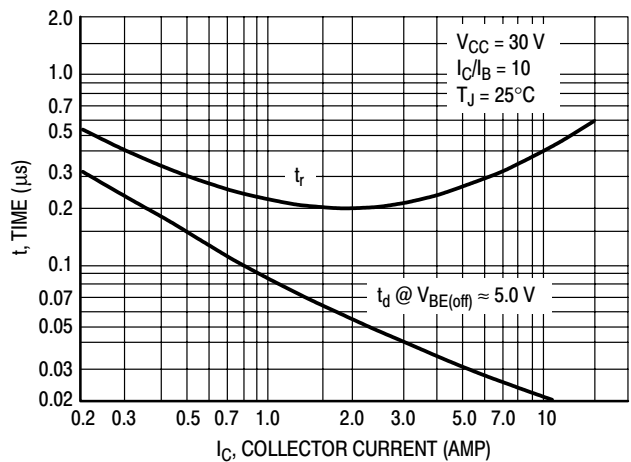


Figure 3. Turn–On Time

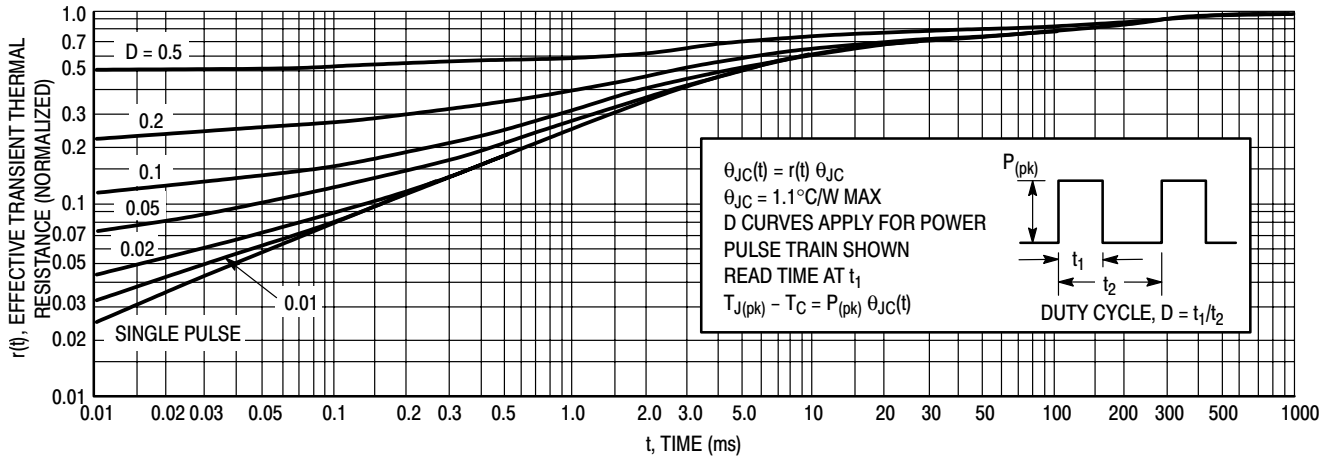


Figure 4. Thermal Response

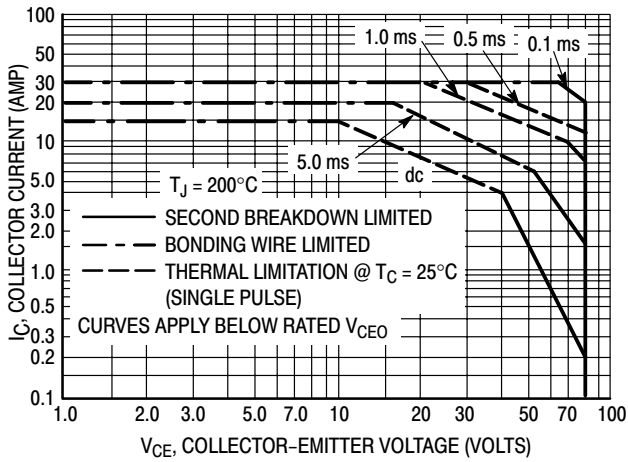


Figure 5. Active-Region Safe Operating Area

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

The data of Figure 5 is based on  $T_{J(pk)} = 200^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 200^\circ\text{C}$ .  $T_{J(pk)}$  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 second breakdown.

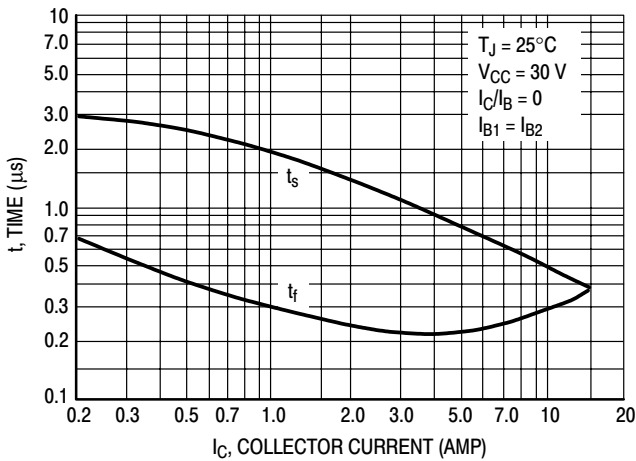


Figure 6. Turn-Off Time

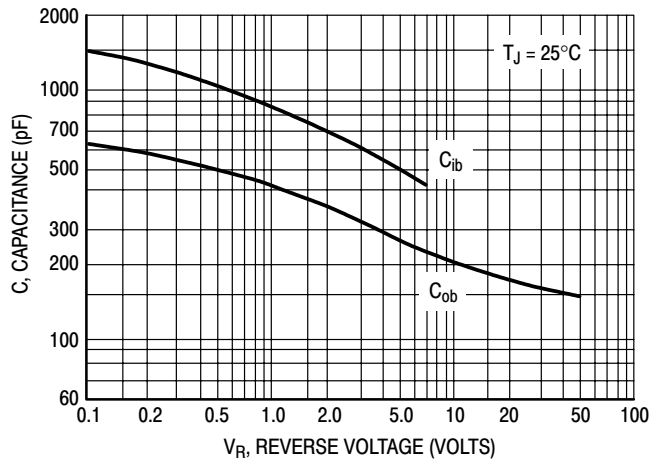


Figure 7. Capacitance

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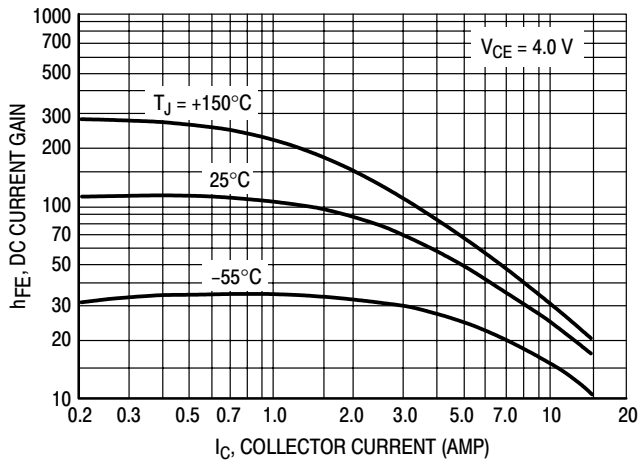


Figure 8. DC Current Gain

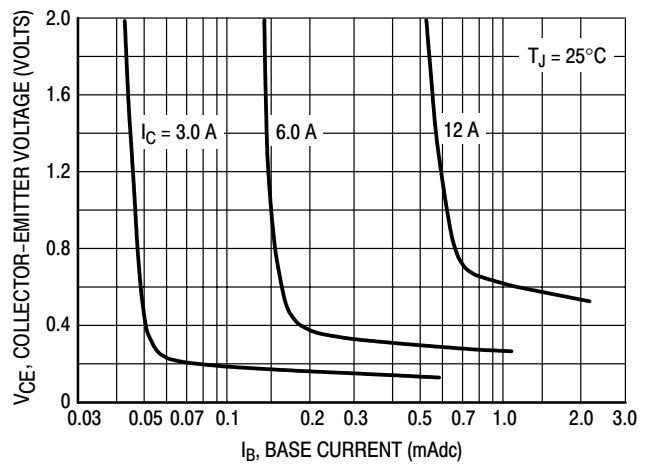


Figure 9. Collector Saturation Region

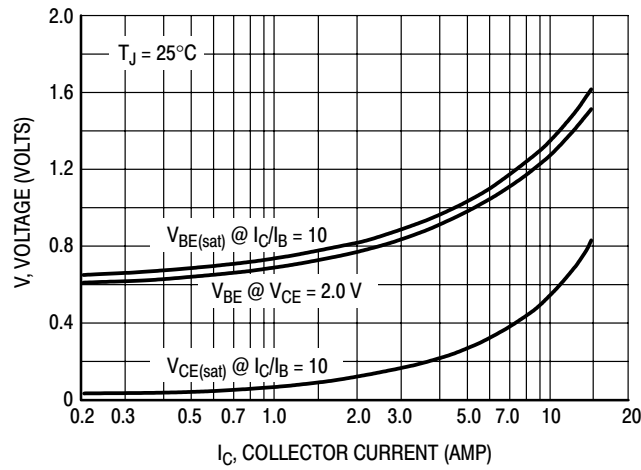
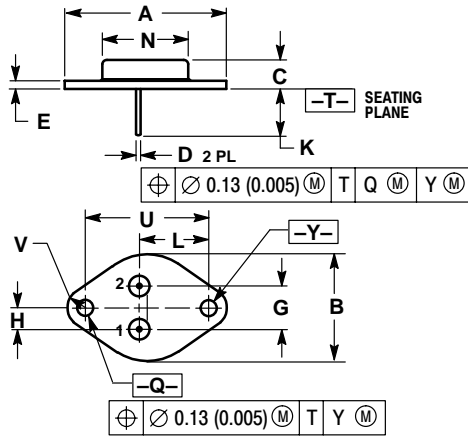


Figure 10. "On" Voltage

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## PACKAGE DIMENSIONS

### CASE 1-07 TO-204AA (TO-3) ISSUE Z



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.550 REF		39.37 REF	
B	---	1.050	---	26.67
C	0.250	0.335	6.35	8.51
D	0.038	0.043	0.97	1.09
E	0.055	0.070	1.40	1.77
G	0.430 BSC		10.92 BSC	
H	0.215 BSC		5.46 BSC	
K	0.440	0.480	11.18	12.19
L	0.665 BSC		16.89 BSC	
N	---	0.830	---	21.08
Q	0.151	0.165	3.84	4.19
U	1.187 BSC		30.15 BSC	
V	0.131	0.188	3.33	4.77

STYLE 1:  
PIN 1: BASE  
2: EMITTER  
CASE: COLLECTOR

**Notes**

**Notes**

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