ON Semiconductor ™

# High-Power PNP Silicon Transistors

. . . designed for use in industrial–military power amplifier and switching circuit applications.

- High Collector–Emitter Sustaining Voltage —
  $V_{CEO(sus)}$ = 100 Vdc (Min) — 2N6437
  = 120 Vdc (Min) — 2N6438
- High DC Current Gain —
  h_{FE} = 20–80 @I_C = 10 Adc
  = 12 (Min) @ I_C = 25 Adc
- Low Collector–Emitter Saturation Voltage —
  $V_{CE(sat)}$ = 1.0 Vdc (Max) @ I_C = 10 Adc
- Fast Switching Times @ I_C = 10 Adc
  t_r = 0.3 μs (Max)
  t_s = 1.0 μs (Max)
  t_f = 0.25 μs (Max)
- Complement to NPN 2N6339 thru 2N6341

2N6437 2N6438 *

**25 AMPERE
POWER TRANSISTORS
PNP SILICON
100, 120 VOLTS
200 WATTS**
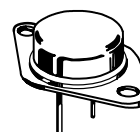
**CASE 1–07
TO–204AA
(TO–3)**

MAXIMUM RATINGS (1)

Rating	Symbol	2N6437	2N6438	Unit
Collector–Base Voltage	V_{CB}	120	140	Vdc
Collector–Emitter Voltage	V_{CEO}	100	120	Vdc
Emitter–Base Voltage	V_{EB}	6.0		Vdc
Collector Current — Continuous Peak	I_C	25 50		Adc
Base Current	I_B	10		Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	200 1.14		Watts W/°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	$R_{\theta JC}$	0.875	°C/W

(1) Indicates JEDEC Registered Data.

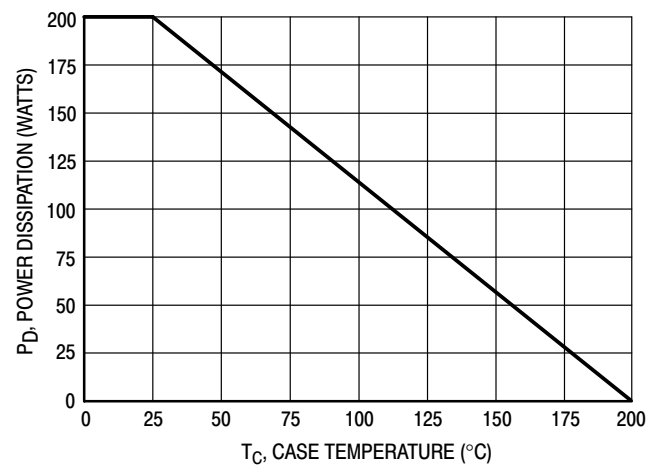**Figure 1. Power Derating**

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (1)	$V_{CEO(sus)}$			Vdc
(I_C = 50 mAdc, I_B = 0) 2N6437		100	—	
2N6438		120	—	
Collector Cutoff Current	I_{CEO}			µAdc
(V_{CE} = 50 Vdc, I_B = 0) 2N6437		—	50	
(V_{CE} = 60 Vdc, I_B = 0) 2N6438		—	50	
Collector Cutoff Current	I_{CEX}			µAdc
(V_{CE} = 110 Vdc, $V_{BE(off)}$ = −1.5 Vdc) 2N6437		—	10	
(V_{CE} = 130 Vdc, $V_{BE(off)}$ = −1.5 Vdc) 2N6438		—	10	
(V_{CE} = 100 Vdc, $V_{BE(off)}$ = −1.5 Vdc, T_C = 150°C) 2N6437		—	1.0	mAdc
(V_{CE} = 120 Vdc, $V_{BE(off)}$ = −1.5 Vdc, T_C = 150°C) 2N6438		—	1.0	
Collector Cutoff Current	I_{CBO}			µAdc
(V_{CB} = 120 Vdc, I_E = 0) 2N6437		—	10	
(V_{CB} = 140 Vdc, I_E = 0) 2N6438		—	10	
Emitter Cutoff Current (V_{EB} = 6.0 Vdc, I_C = 0)	I_{EBO}	—	100	µAdc
ON CHARACTERISTICS				
DC Current Gain (1)	h_{FE}			—
(I_C = 0.5 Adc, V_{CE} = 2.0 Vdc)		30	—	
(I_C = 10 Adc, V_{CE} = 2.0 Vdc)		20	120	
(I_C = 25 Adc, V_{CE} = 2.0 Vdc)		12	—	
Collector–Emitter Saturation Voltage (1)	$V_{CE(sat)}$			Vdc
(I_C = 10 Adc, I_B = 1.0 Adc)		—	1.0	
(I_C = 25 Adc, I_B = 2.5 Adc)		—	1.8	
Base–Emitter Saturation Voltage (1)	$V_{BE(sat)}$			Vdc
(I_C = 10 Adc, I_B = 1.0 Adc)		—	1.8	
(I_C = 25 Adc, I_B = 2.5 Adc)		—	2.5	
DYNAMIC CHARACTERISTICS				
Current–Gain — Bandwidth Product (I_C = 1.0 Adc, V_{CE} = 10 Vdc, f_{test} = 10 MHz)	f_T	40	—	MHz
Output Capacitance (V_{CE} = 10 Vdc, I_E = 0, f = 100 kHz)	C_{ob}	—	700	pF
SWITCHING CHARACTERISTICS				
Rise Time (V_{CC} = 80 Vdc, I_C = 10 A, $V_{BE(off)}$ = 6.0 Vdc, I_{B1} = 1.0 Adc)	t_r	—	0.3	µs
Storage (V_{CC} = 80 Vdc, I_C = 10 A, $V_{BE(off)}$ = 6.0 Vdc, I_{B1} = I_{B2} = 1.0 Adc)	t_s	—	1.0	µs
Fall Time (V_{CC} = 80 Vdc, I_C = 10 A, $V_{BE(off)}$ = 6.0 Vdc, I_{B1} = I_{B2} = 1.0 Adc)	t_f	—	0.25	µs

*Indicates JEDEC Registered Data.
(1) Pulse Test: Pulse Width ≤ 300 µs; Duty Cycle ≤ 2.0%.
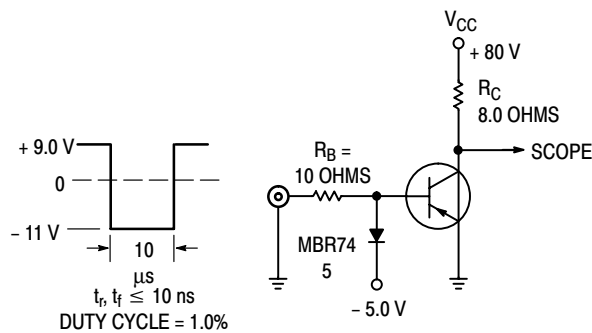
NOTE: For information on Figures 3 and 6, R_B and R_C were varied to obtain desired test conditions.

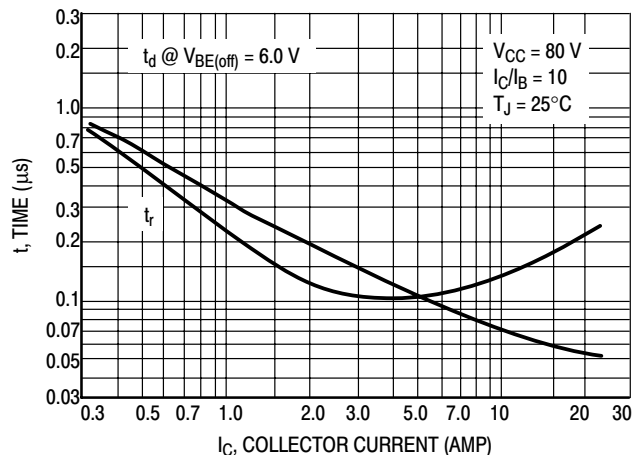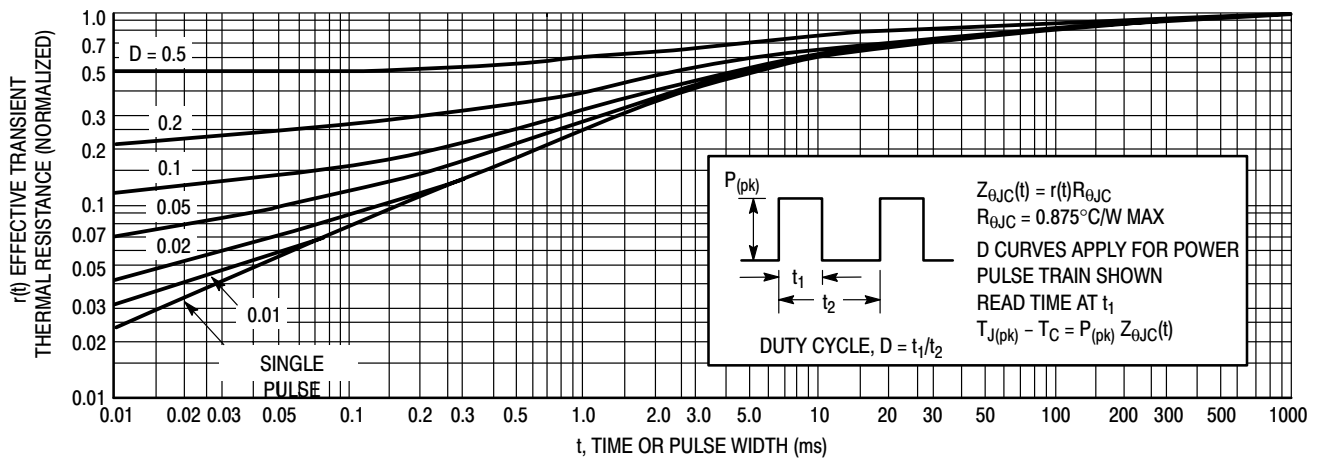**Figure 2. Switching Time Test Circuit**

Figure 3. Turn–On Time

Figure 4. Thermal Response

$Z_{\theta JC}(t) = r(t)R_{\theta JC}$
$R_{\theta JC} = 0.875°C/W$ MAX
D CURVES APPLY FOR POWER
PULSE TRAIN SHOWN
READ TIME AT t_1
$T_{J(pk)} - T_C = P_{(pk)} Z_{\theta JC}(t)$
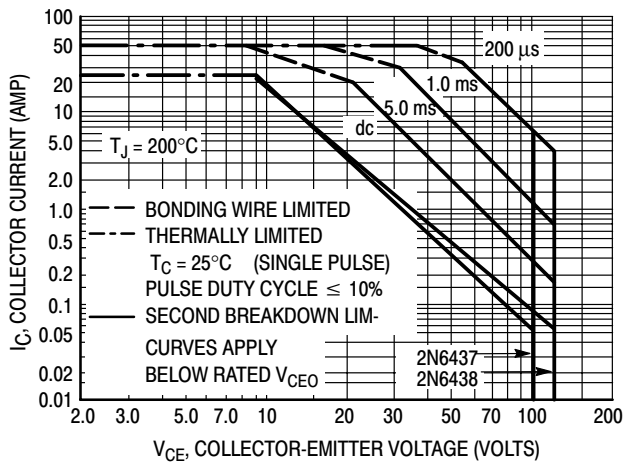
DUTY CYCLE, D = t_1/t_2

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 $T_{J(pk)} = 200°C$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 200°C$. $T_{J(pk)}$ 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.
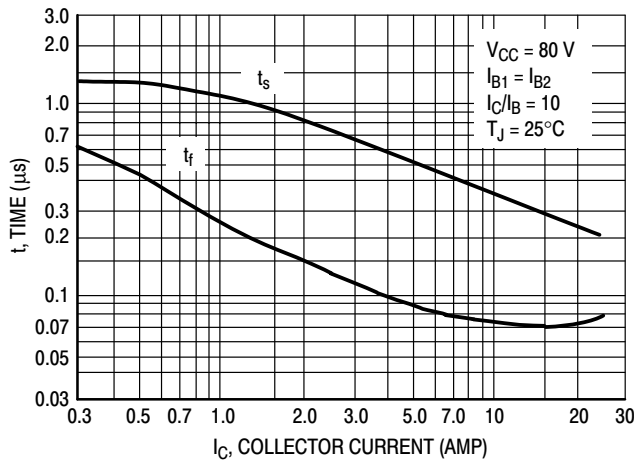
Figure 6. Turn-Off Time
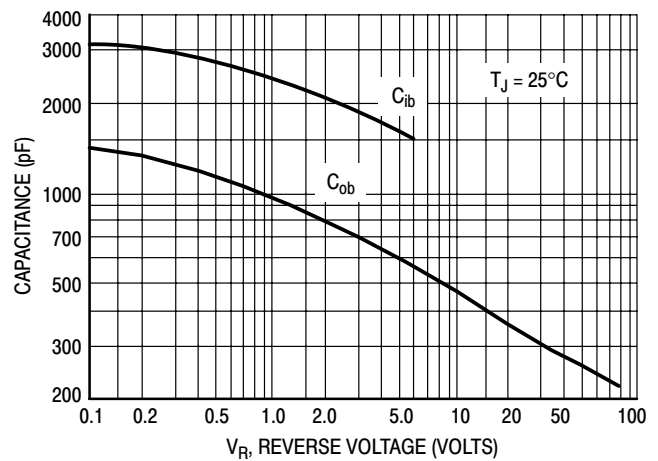
Figure 7. Capacitance
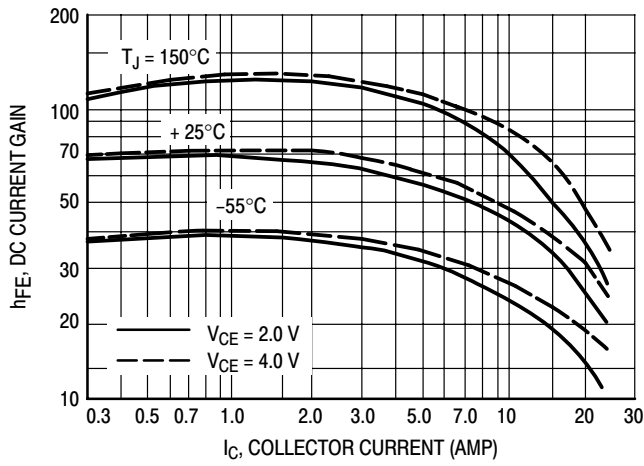
Figure 8. DC Current Gain
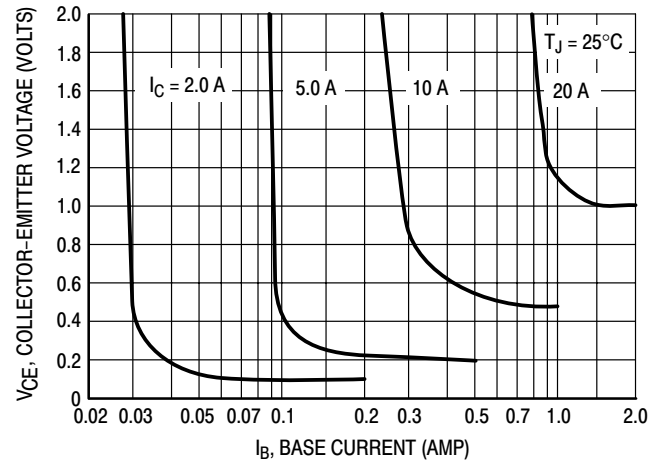
Figure 9. Collector Saturation Region
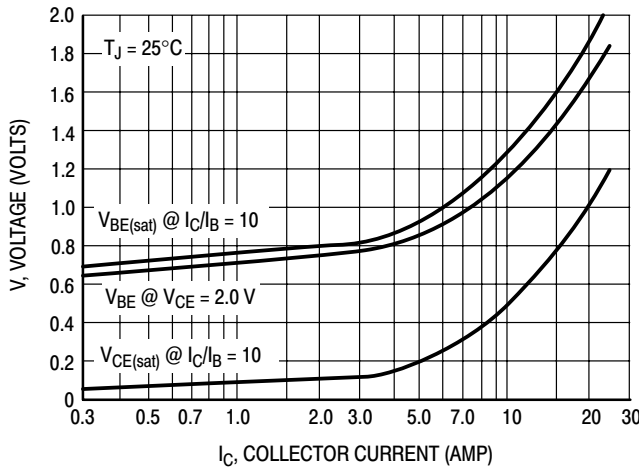
Figure 10. "On" Voltages
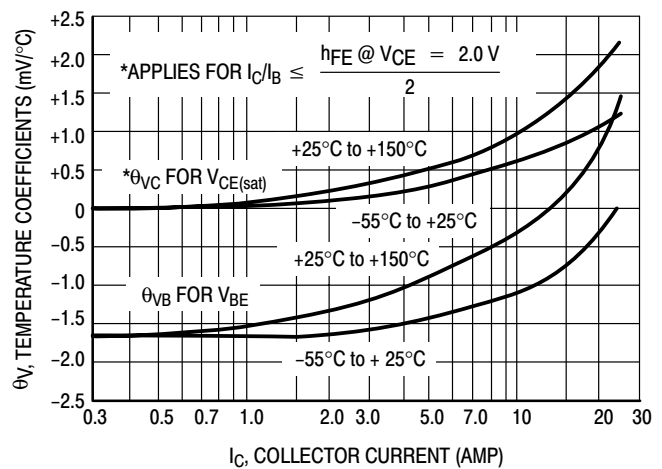
Figure 11. Temperature Coefficients
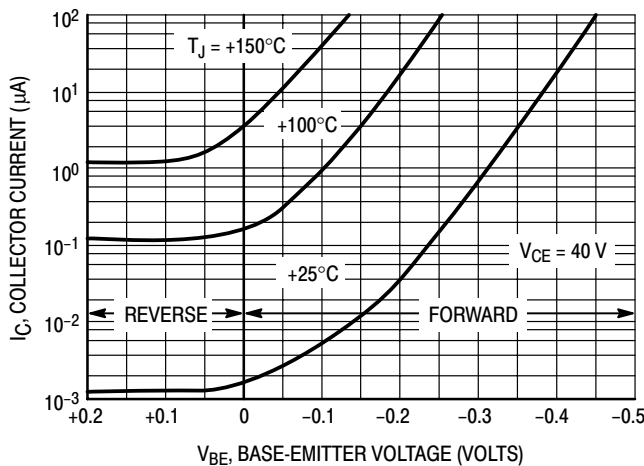
Figure 12. Collector Cut-Off Region
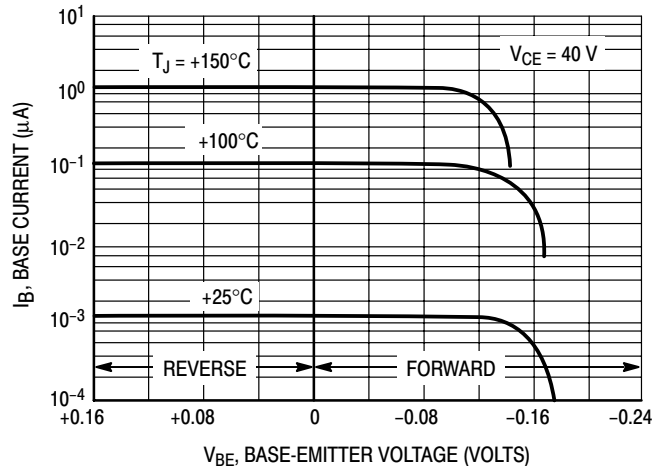
Figure 13. Base Cutoff Region

PACKAGE DIMENSIONS

CASE 1–07
TO–204AA (TO–3)
ISSUE Z
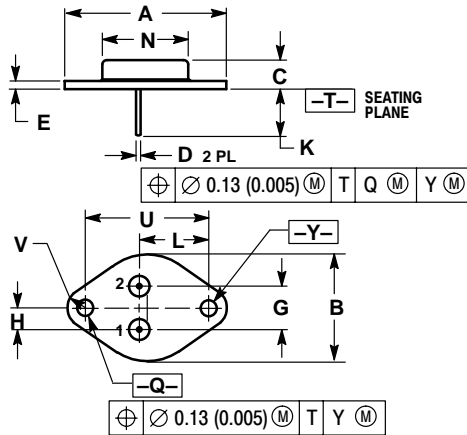
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO–204AA OUTLINE SHALL APPLY.

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

<u>Notes</u>

2N6437 2N6438

2N6437/D