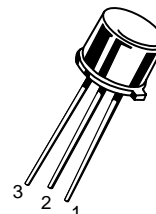
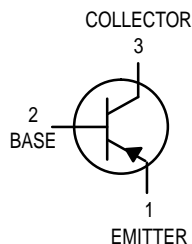


# Amplifier Transistors

## PNP Silicon

**BC161-16**



CASE 79-04, STYLE 1  
TO-39 (TO-205AD)

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	–60	Vdc
Collector–Base Voltage	$V_{CBO}$	–60	Vdc
Emitter–Base Voltage	$V_{EBO}$	–5.0	Vdc
Collector Current — Continuous	$I_C$	–1.0	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	0.8 4.6	Watts mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	3.7 20	Watts mW/ $^\circ\text{C}$
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 Ambient	$R_{\theta JA}$	219	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	50	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector Cutoff Current ( $I_E = 0, V_{CES} = -60 \text{ Vdc}$ ) ( $I_E = 0, V_{CES} = -60 \text{ Vdc}, T_{Amb} = 150^\circ\text{C}$ )	$I_{CES}$	— —	–100 –100	nAdc $\mu\text{Adc}$
Collector–Emitter Breakdown Voltage ( $I_C = -100 \mu\text{Adc}, I_E = 0$ )	$V_{(BR)CES}$	–60	—	Vdc
Collector–Emitter Breakdown Voltage <sup>(1)</sup> ( $I_C = -10 \text{ mAdc}, I_B = 0$ )	$V_{(BR)CEO}$	–60	—	Vdc
Emitter–Base Breakdown Voltage ( $I_E = -100 \mu\text{Adc}, I_C = 0$ )	$V_{(BR)EBO}$	–5.0	—	Vdc

1. Pulsed: Pulse Duration = 300  $\mu\text{s}$ , Duty Cycle = 2.0%.

(Replaces BC160-16/D)

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

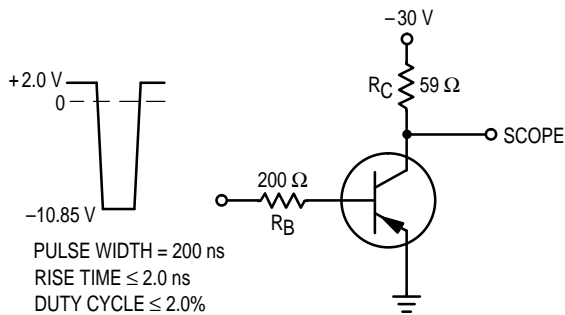
Characteristic	Symbol	Min	Max	Unit
<b>ON CHARACTERISTICS</b>				
DC Current Gain <sup>(1)</sup> ( $I_C = -100\text{ mAdc}$ , $V_{CE} = -1.0\text{ Vdc}$ )	$h_{FE}$	100	250	—
Collector–Emitter Saturation Voltage <sup>(1)</sup> ( $I_C = -1.0\text{ Adc}$ , $I_B = -0.1\text{ Adc}$ )	$V_{CE(sat)}$	—	-1.0	Vdc
Base–Emitter Saturation Voltage <sup>(1)</sup> ( $I_C = -1.0\text{ Adc}$ , $V_{CE} = -1.0\text{ Vdc}$ )	$V_{BE(on)}$	—	-1.7	Vdc

**SMALL–SIGNAL CHARACTERISTICS**

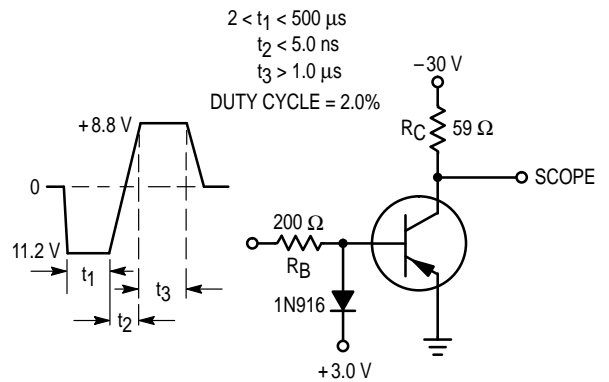
Gain Bandwidth Product ( $I_C = -50\text{ mAdc}$ , $V_{CE} = -10\text{ Vdc}$ , $f = 20\text{ MHz}$ )	$f_T$	50	—	MHz
Input Capacitance ( $V_{EB} = -10\text{ Vdc}$ , $f = 1.0\text{ MHz}$ )	$C_{ib}$	—	180	pF
Output Capacitance ( $V_{CB} = -10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	—	30	pF
Turn–On Time ( $I_C = -100\text{ mAdc}$ , $I_{B1} = -5.0\text{ }\mu\text{Adc}$ )	$t_{on}$	—	500	ns
Turn–Off Time ( $I_C = -100\text{ mAdc}$ , $I_{B1} = I_{B2} = -5.0\text{ }\mu\text{Adc}$ )	$t_{off}$	—	650	ns

1. Pulsed: Pulse Duration = 300  $\mu\text{s}$ , Duty Cycle = 2.0%.

**SWITCHING TIME EQUIVALENT TEST CIRCUITS**



**Figure 1. Turn–On**



**Figure 2. Turn–Off**

TRANSIENT CHARACTERISTICS

25°C      100°C

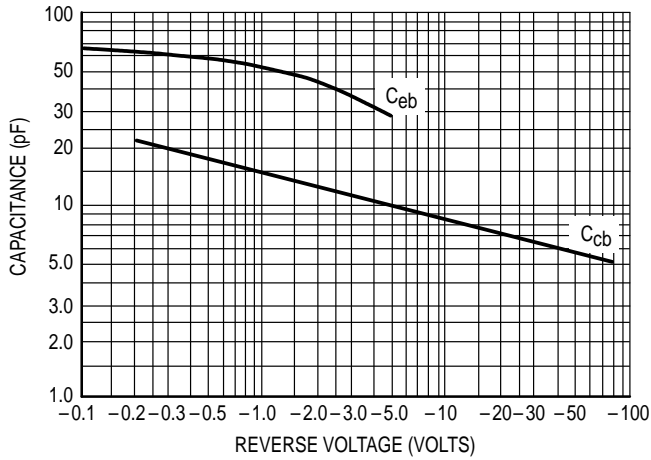


Figure 3. Capacitances

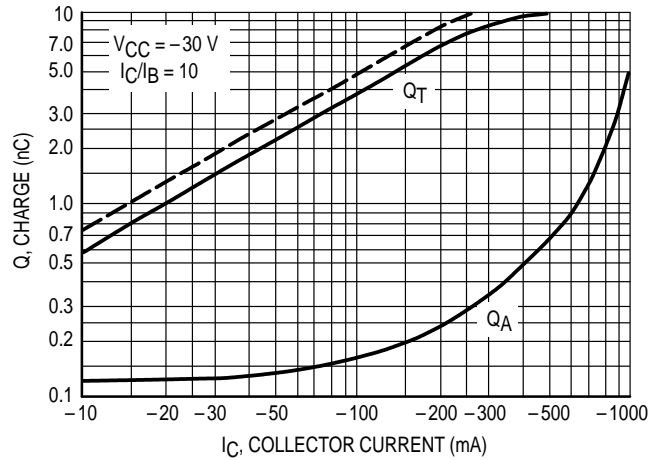


Figure 4. Charge Data

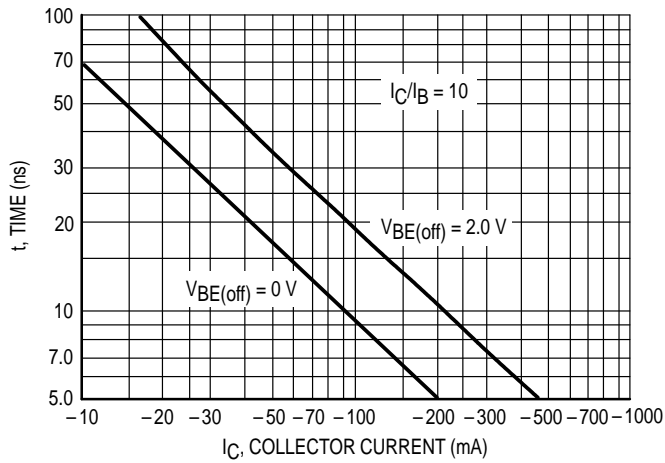


Figure 5. Delay Time

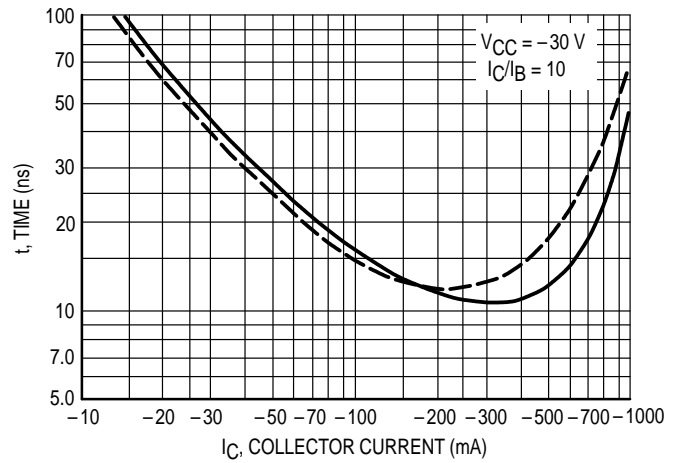


Figure 6. Rise Time

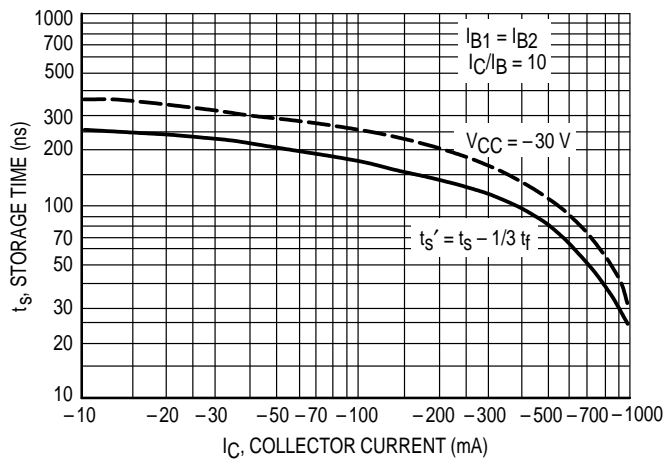


Figure 7. Storage Time

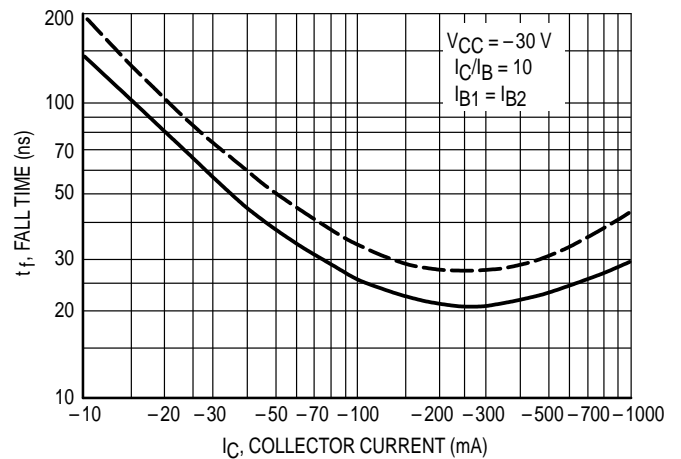


Figure 8. Fall Time

**SMALL-SIGNAL CHARACTERISTICS  
NOISE FIGURE**

$V_{CE} = 10 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$

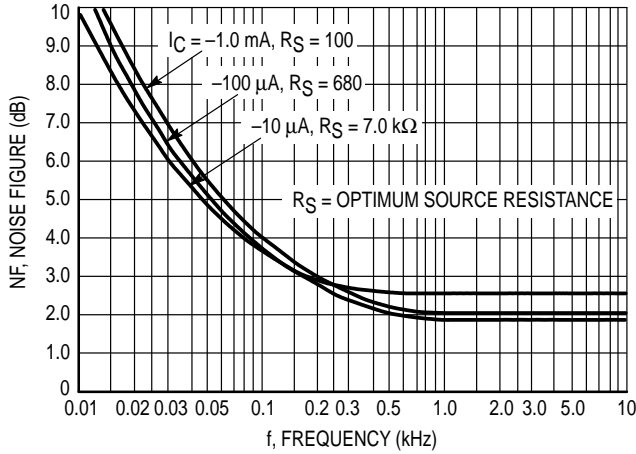


Figure 9. Frequency Effects

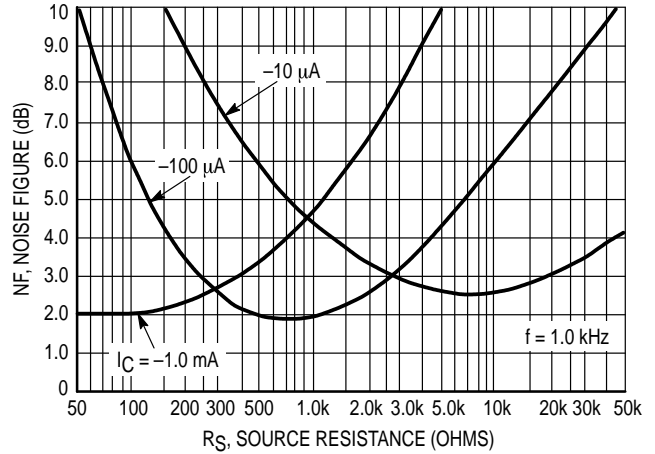


Figure 10. Source Resistance Effects

**h PARAMETERS**

$V_{CE} = 10 \text{ Vdc}$ ,  $f = 1.0 \text{ kHz}$ ,  $T_A = 25^\circ\text{C}$

This group of graphs illustrates the relationship of the "h" parameters for this series of transistors. To obtain these curves, 4 units were selected and identified by number - the same units were used to develop curves on each graph.

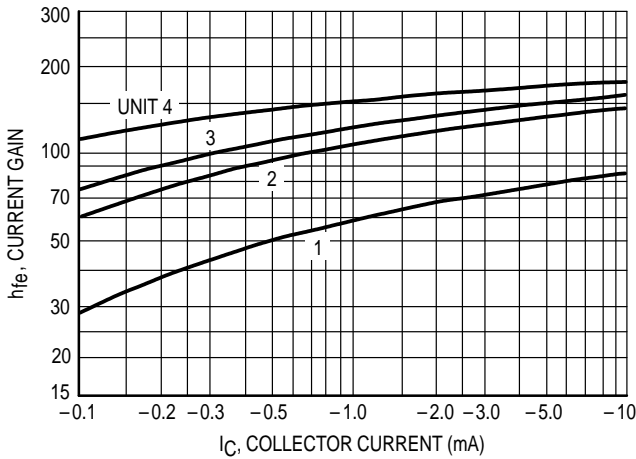


Figure 11. Current Gain

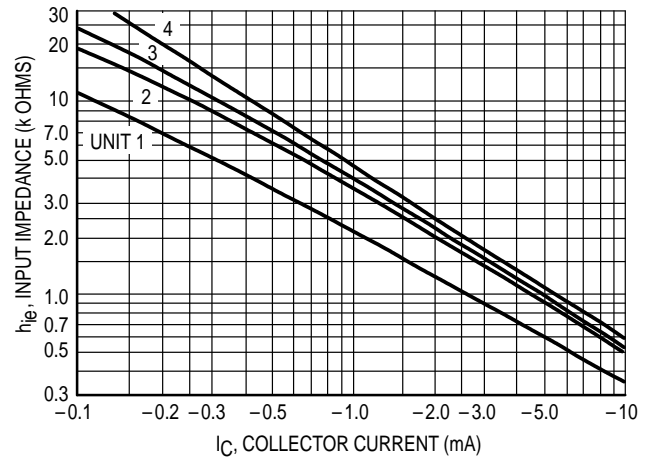


Figure 12. Input Impedance

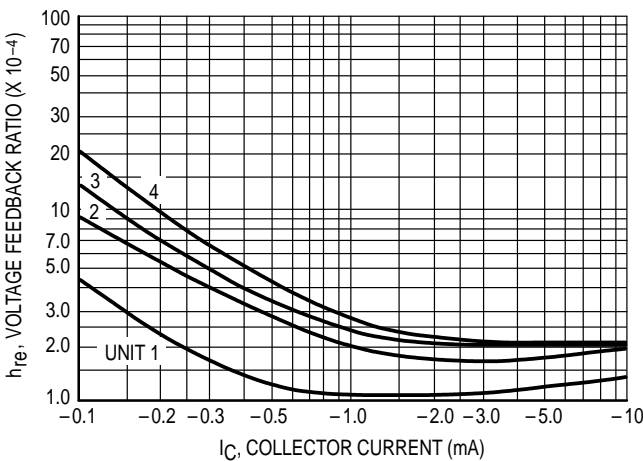


Figure 13. Voltage Feedback Ratio

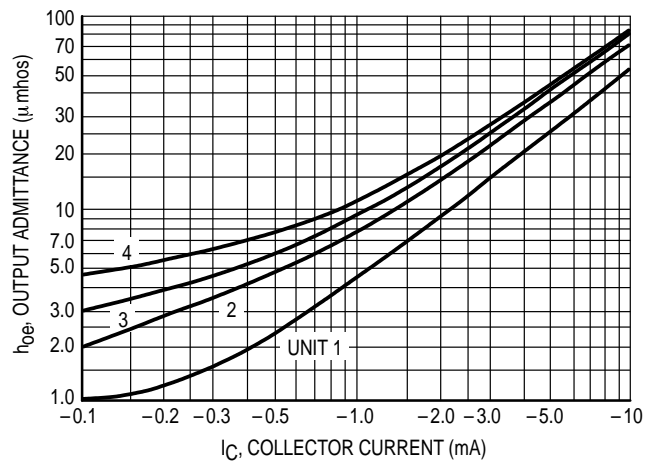


Figure 14. Output Admittance

STATIC CHARACTERISTICS

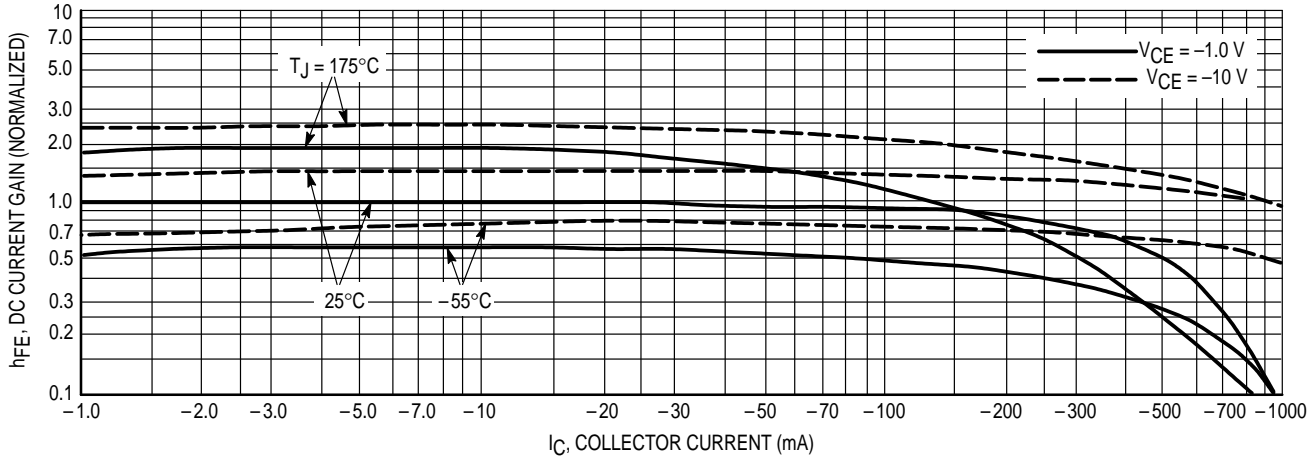


Figure 15. DC Current Gain

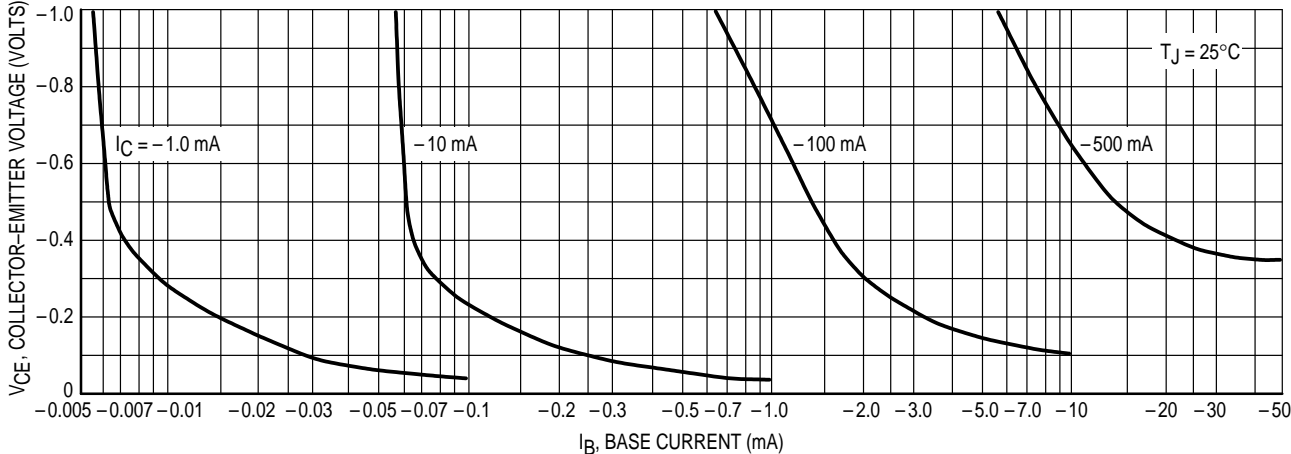


Figure 16. Collector Saturation Region

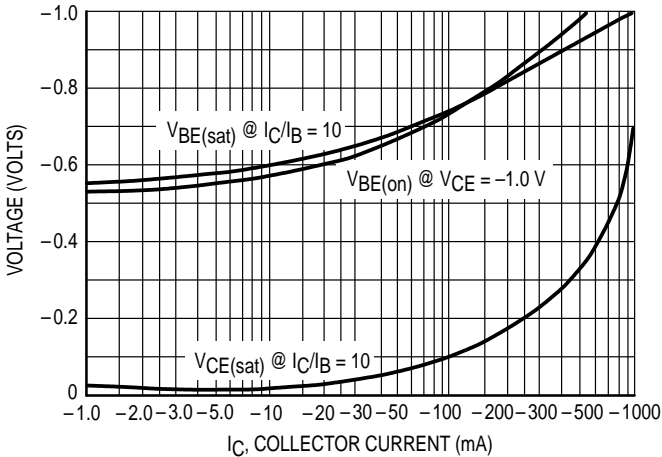


Figure 17. "On" Voltages

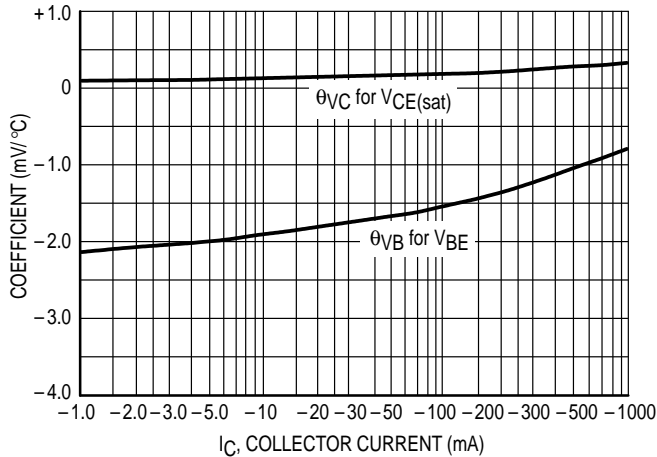


Figure 18. Temperature Coefficients

RATINGS AND THERMAL DATA

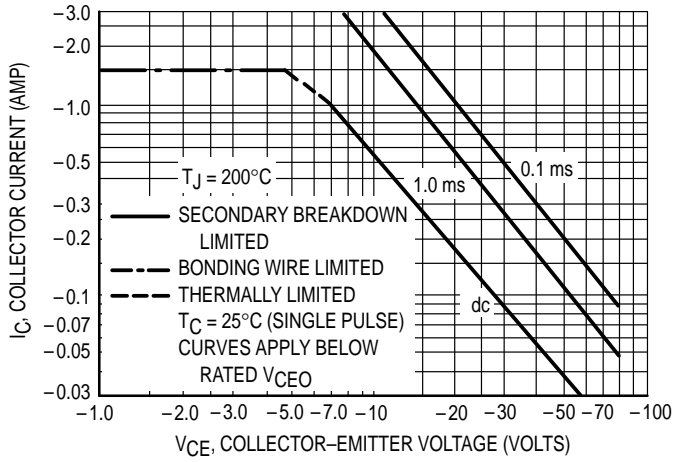
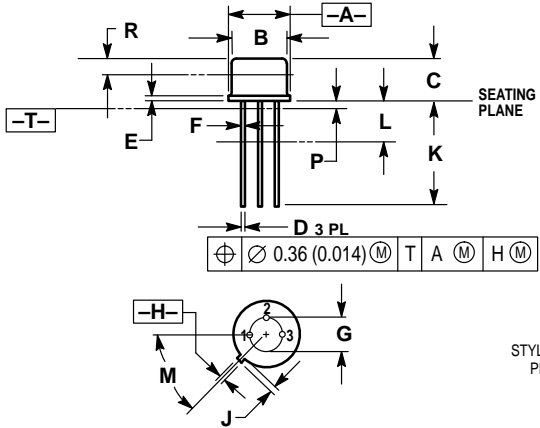


Figure 19. Safe Operating Area

The safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 19 is based upon  $T_{J(pk)} = 200^\circ\text{C}$ ;  $T_C$  is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 200^\circ\text{C}$ . At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

PACKAGE DIMENSIONS




$\oplus \text{ } \varnothing 0.36 (0.014) \text{ (M) T A (M) H (M)}$

STYLE 1:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

**CASE 079-04  
(TO-205AD)  
ISSUE N**

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION J MEASURED FROM DIMENSION A MAXIMUM.
  4. DIMENSION B SHALL NOT VARY MORE THAN 0.25 (0.010) IN ZONE R. THIS ZONE CONTROLLED FOR AUTOMATIC HANDLING.
  5. DIMENSION F APPLIES BETWEEN DIMENSION P AND L. DIMENSION D APPLIES BETWEEN DIMENSION L AND K MINIMUM. LEAD DIAMETER IS UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.335	0.370	8.51	9.39
B	0.305	0.335	7.75	8.50
C	0.240	0.260	6.10	6.60
D	0.016	0.021	0.41	0.53
E	0.009	0.041	0.23	1.04
F	0.016	0.019	0.41	0.48
G	0.200 BSC		5.08 BSC	
H	0.028	0.034	0.72	0.86
J	0.029	0.045	0.74	1.14
K	0.500	0.750	12.70	19.05
L	0.250	—	6.35	—
M	45° BSC		45° BSC	
P	—	0.050	—	1.27
R	0.100	—	2.54	—

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