

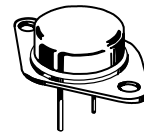
## Silicon NPN Power Transistors

... designed for medium-speed switching and amplifier applications. These devices feature:

- Total Switching Time at 3 A typically 1.15  $\mu$ s
- Gain Ranges Specified at 1 A and 3 A
- Low  $V_{CE(sat)}$ : typically 0.5 V at  $I_C = 5$  A and  $I_B = 0.5$  A
- Excellent Safe Operating Areas
- Complement to 2N3791-92

**NPN**  
**2N3715**  
**2N3716**

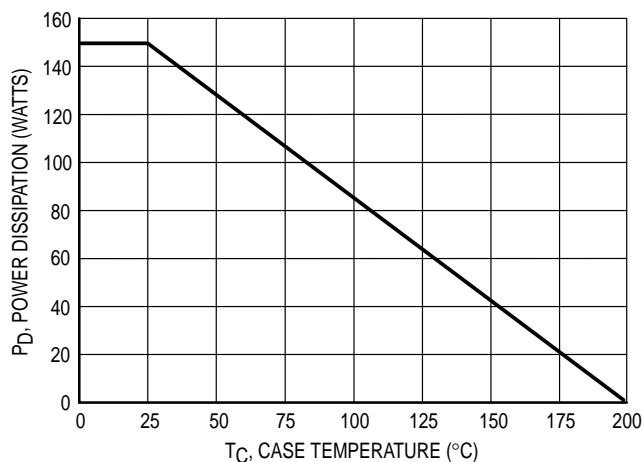
**10 AMPERE**  
**POWER TRANSISTORS**  
**SILICON NPN**  
**60-80 VOLTS**  
**150 WATTS**



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

### MAXIMUM RATINGS

Rating	Symbol	2N3715	2N3716	Unit
Collector-Emitter Voltage	$V_{CEO}$	60	80	Volts
Collector-Base Voltage	$V_{CB}$	80	100	Volts
Emitter-Base Voltage	$V_{EB}$	7.0	7.0	Volts
Collector Current	$I_C$	10	10	Amps
Base Current	$I_B$	4.0	4.0	Amps
Power Dissipation	$P_D$	150	150	Watts
Thermal Resistance	$\theta_{JC}$	1.17	1.17	$^{\circ}C/W$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-65 to +200		$^{\circ}C$



**Figure 1. Power-Temperature Derating Curve**

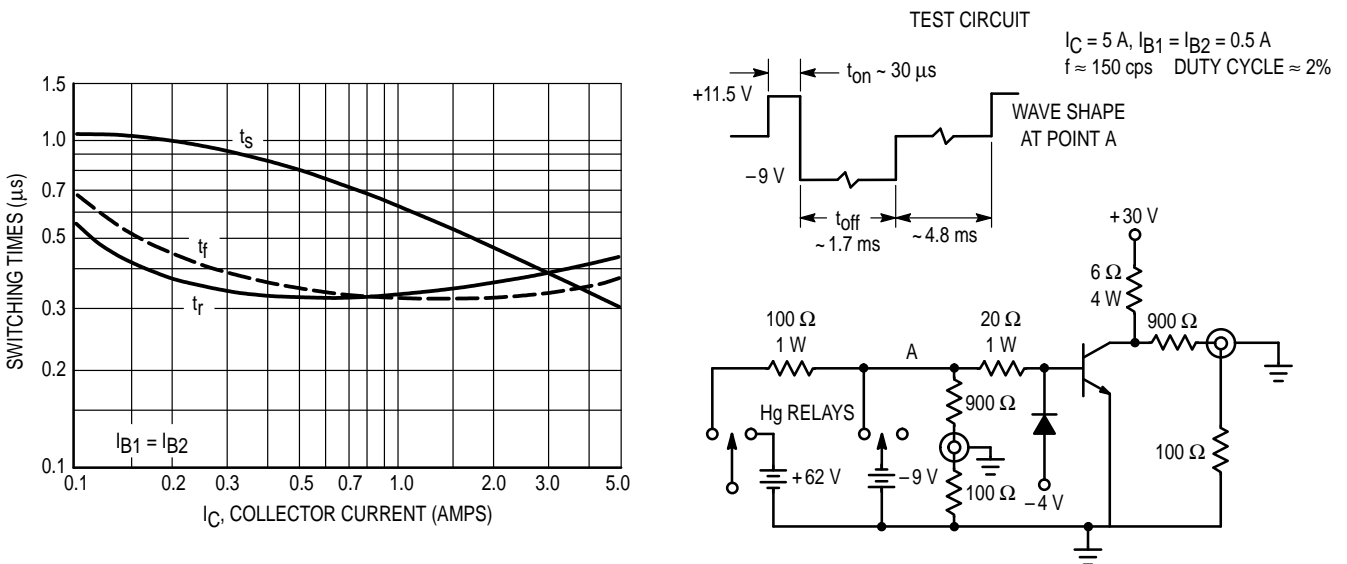
Safe Area Limits are indicated by Figures 12, 13. Both limits are applicable and must be observed.

REV 7

ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
Emitter-Base Cutoff Current (V <sub>EB</sub> = 7.0 Vdc)	I <sub>EBO</sub>	—	5.0	mAdc
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 80 Vdc, V <sub>BE</sub> = -1.5 Vdc) (V <sub>CE</sub> = 100 Vdc, V <sub>BE</sub> = -1.5 Vdc) (V <sub>CE</sub> = 60 Vdc, V <sub>BE</sub> = -1.5 Vdc, T <sub>C</sub> = 150°C) (V <sub>CE</sub> = 80 Vdc, V <sub>BE</sub> = -1.5 Vdc, T <sub>C</sub> = 150°C)	I <sub>CEX</sub>	—	1.0 1.0 10 10	mAdc
Collector-Emitter Sustaining Voltage (1) (I <sub>C</sub> = 200 mAdc, I <sub>B</sub> = 0)	V <sub>CEO(sus)*</sub>	60 80	— —	Vdc
DC Current Gain (1) (I <sub>C</sub> = 1.0 Adc, V <sub>CE</sub> = 2.0 Vdc) (I <sub>C</sub> = 3.0 Adc, V <sub>CE</sub> = 2.0 Vdc)	h <sub>FE*</sub>	50 30	150 —	—
Collector-Emitter Saturation Voltage (1) (I <sub>C</sub> = 5.0 Adc, I <sub>B</sub> = 0.5 Adc)	V <sub>CE(sat)*</sub>	—	0.8	Vdc
Base-Emitter Saturation Voltage (1) (I <sub>C</sub> = 5.0 Adc, I <sub>B</sub> = 0.5 Adc)	V <sub>BE(sat)*</sub>	—	1.5	Vdc
Base-Emitter Voltage (1) (I <sub>C</sub> = 3.0 Adc, V <sub>CE</sub> = 2.0 Vdc)	V <sub>BE*</sub>	—	1.5	Vdc
Small Signal Current Gain (V <sub>CE</sub> = 10 Vdc, I <sub>C</sub> = 0.5 Adc, f = 1.0 MHz)	h <sub>fe</sub>	4.0	—	—
Switching Times (Figure 2) (I <sub>C</sub> = 5.0 A, I <sub>B1</sub> = I <sub>B2</sub> = 0.5 Adc) Rise Time Storage Time Fall Time			<b>Typ</b> 0.45 0.3 0.4	μs

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.



## 2N3715 2N3716

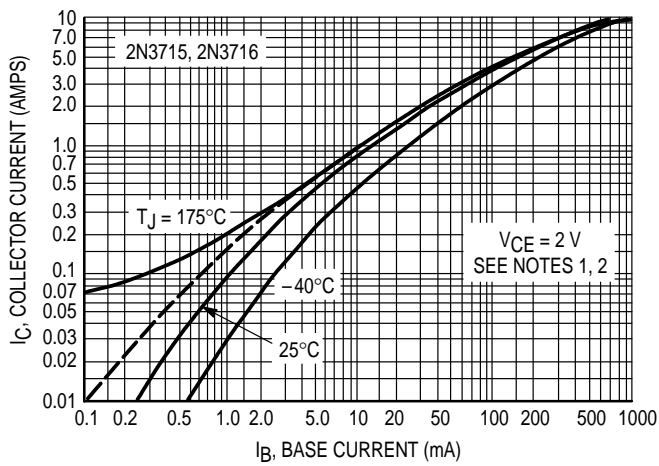


Figure 3. Collector Current versus Base Current

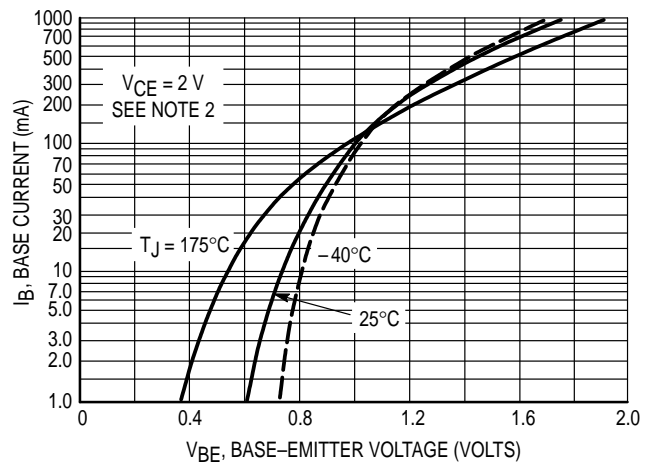


Figure 4. Base Current-Voltage Variations

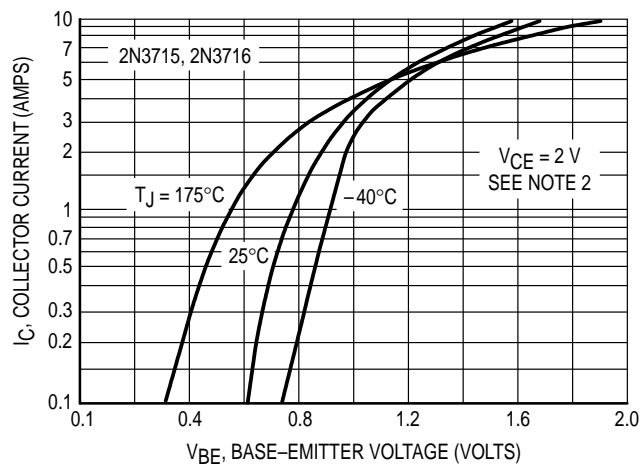


Figure 5. Collector Current-Voltage Variations

NOTE 1. Dotted line indicates metered base current plus the  $I_{CBO}$  of the transistor at  $175^\circ\text{C}$ .

NOTE 2. Pulse test: pulse width  $\approx 200\ \mu\text{sec}$ , duty cycle  $\approx 1.5\%$ .

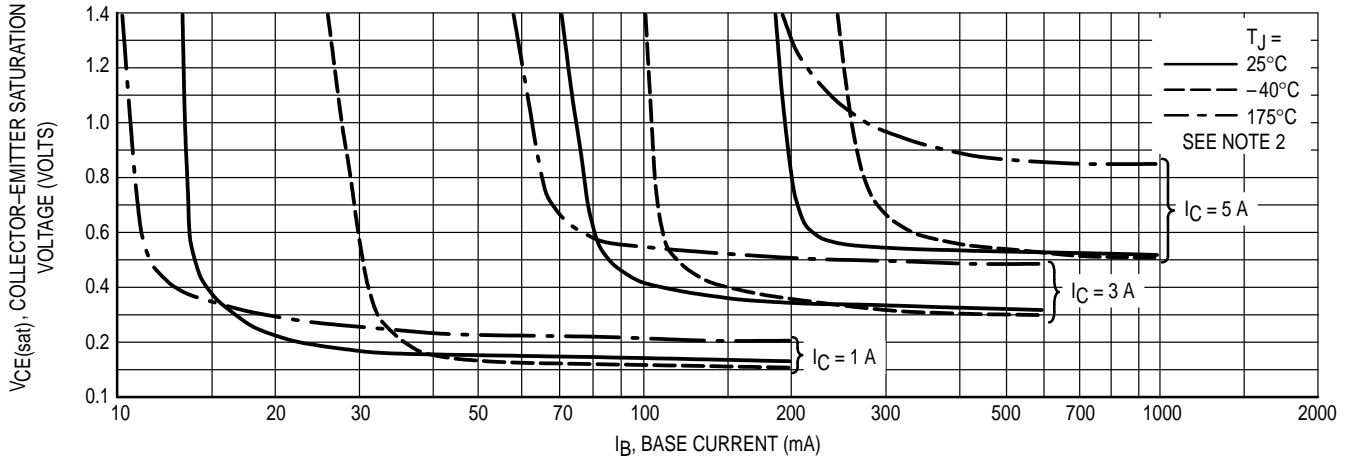


Figure 6. Collector-Emitter Saturation Voltage Variations

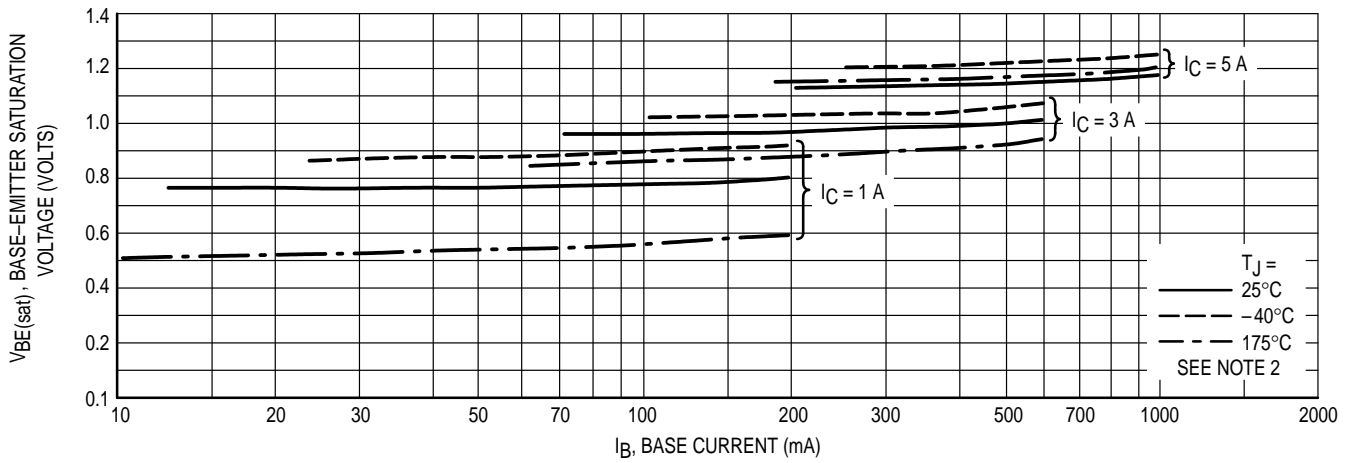


Figure 7. Base-Emitter Saturation Voltage Variations

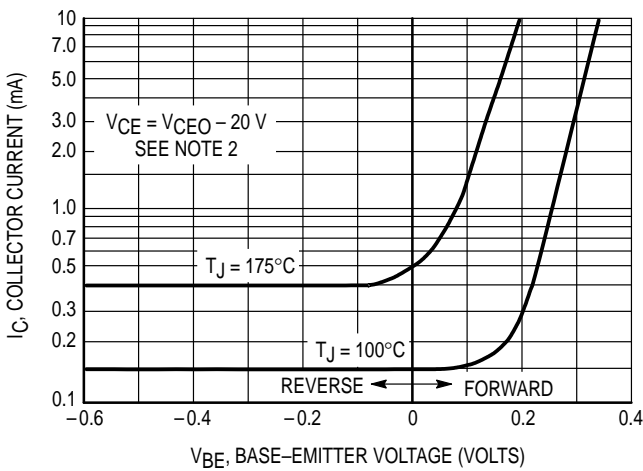


Figure 8. Collector Current versus Base-Emitter Voltage

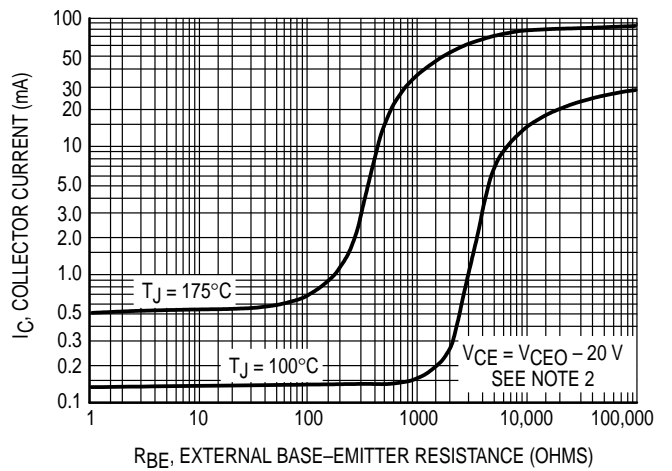


Figure 9. Collector Current versus Base-Emitter Resistance

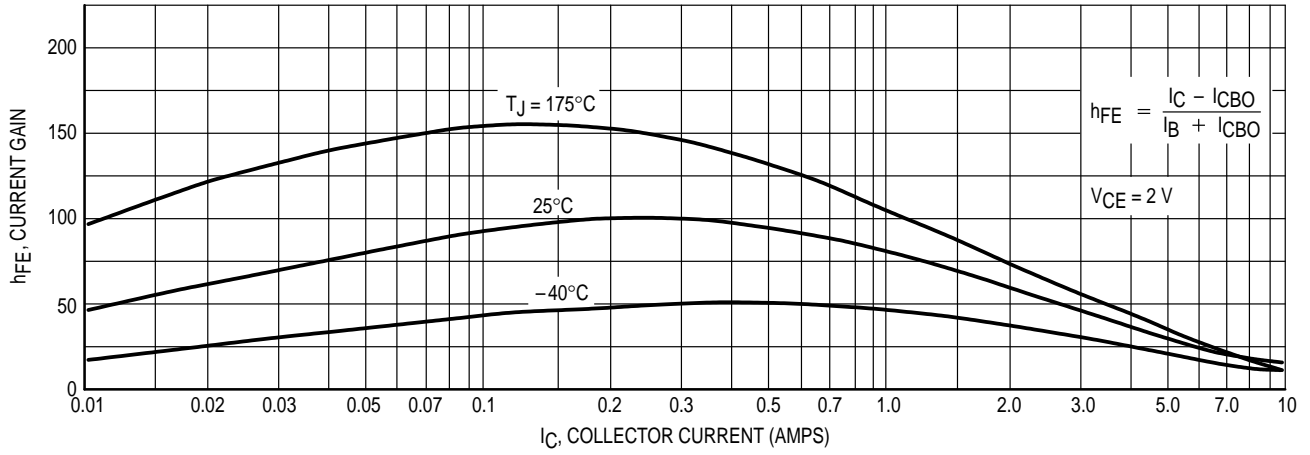


Figure 10. Current Gain Variations

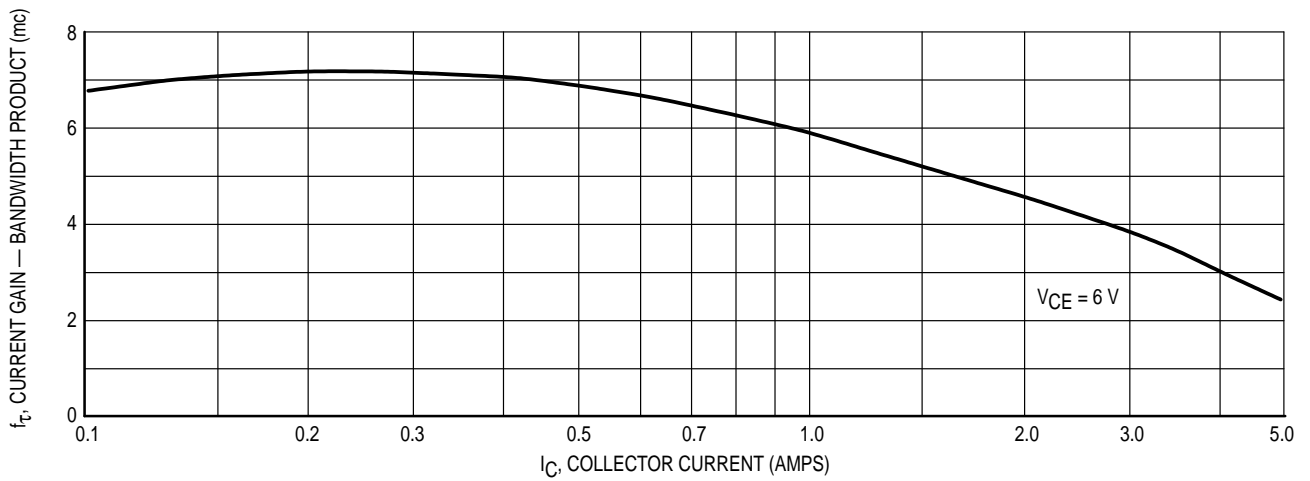


Figure 11. Current Gain — Bandwidth Product versus Collector Current

SAFE OPERATING AREAS

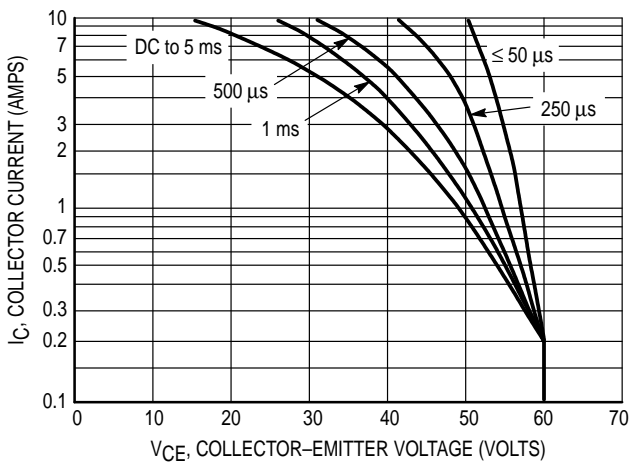


Figure 12. 2N3715

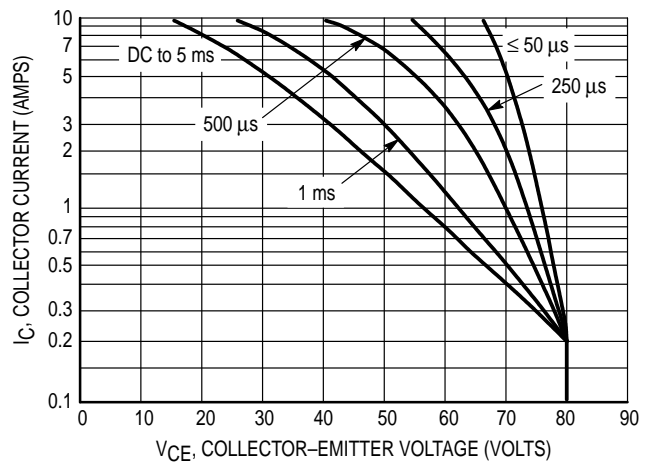
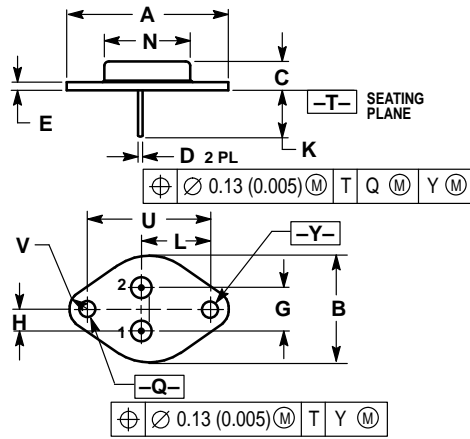


Figure 13. 2N3716

The Safe Operating Area Curves indicate  $I_C - V_{CE}$  limits below which the device will not go into secondary breakdown. Collector load lines for specific circuits must fall within the applicable Safe Area to avoid causing a collector-emitter

short. (Duty cycle of the excursions make no significant change in these safe areas.) To insure operation below the maximum  $T_J$ , the power-temperature derating curve must be observed for both steady state and pulse power conditions.

PACKAGE DIMENSIONS



- 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

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

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