

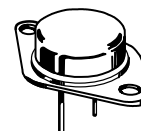
Silicon NPN Power Transistors

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

- Total Switching Time at 3 A typically 1.15 μ 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	θ_{JC}	1.17	1.17	$^{\circ}\text{C/W}$
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-65 to +200		$^{\circ}\text{C}$

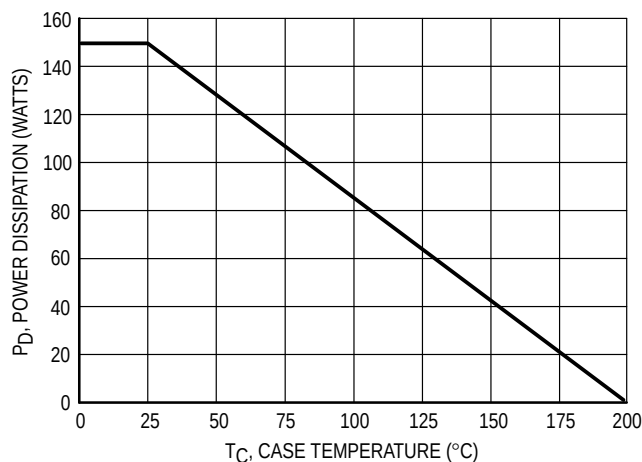


Figure 1. Power-Temperature Derating Curve

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

REV 7

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

Characteristic	Symbol	Min	Max	Unit
Emitter–Base Cutoff Current ($V_{EB} = 7.0\text{ Vdc}$)	I_{EBO}	—	5.0	mAdc
Collector–Emitter Cutoff Current ($V_{CE} = 80\text{ Vdc}$, $V_{BE} = -1.5\text{ Vdc}$) ($V_{CE} = 100\text{ Vdc}$, $V_{BE} = -1.5\text{ Vdc}$) ($V_{CE} = 60\text{ Vdc}$, $V_{BE} = -1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 80\text{ Vdc}$, $V_{BE} = -1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$)	I_{CEX}	— — — —	1.0 1.0 10 10	mAdc
Collector–Emitter Sustaining Voltage (1) ($I_C = 200\text{ mAdc}$, $I_B = 0$)	$V_{CEO(sus)}^*$	60 80	— —	Vdc
DC Current Gain (1) ($I_C = 1.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$)	h_{FE}^*	50 30	150 —	—
Collector–Emitter Saturation Voltage (1) ($I_C = 5.0\text{ Adc}$, $I_B = 0.5\text{ Adc}$)	$V_{CE(sat)}^*$	—	0.8	Vdc
Base–Emitter Saturation Voltage (1) ($I_C = 5.0\text{ Adc}$, $I_B = 0.5\text{ Adc}$)	$V_{BE(sat)}^*$	—	1.5	Vdc
Base–Emitter Voltage (1) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$)	V_{BE}^*	—	1.5	Vdc
Small Signal Current Gain ($V_{CE} = 10\text{ Vdc}$, $I_C = 0.5\text{ Adc}$, $f = 1.0\text{ MHz}$)	h_{fe}	4.0	—	—
Switching Times (Figure 2) ($I_C = 5.0\text{ A}$, $I_{B1} = I_{B2} = 0.5\text{ Adc}$) Rise Time Storage Time Fall Time	t_r t_s t_f	Typ 0.45 0.3 0.4		μs

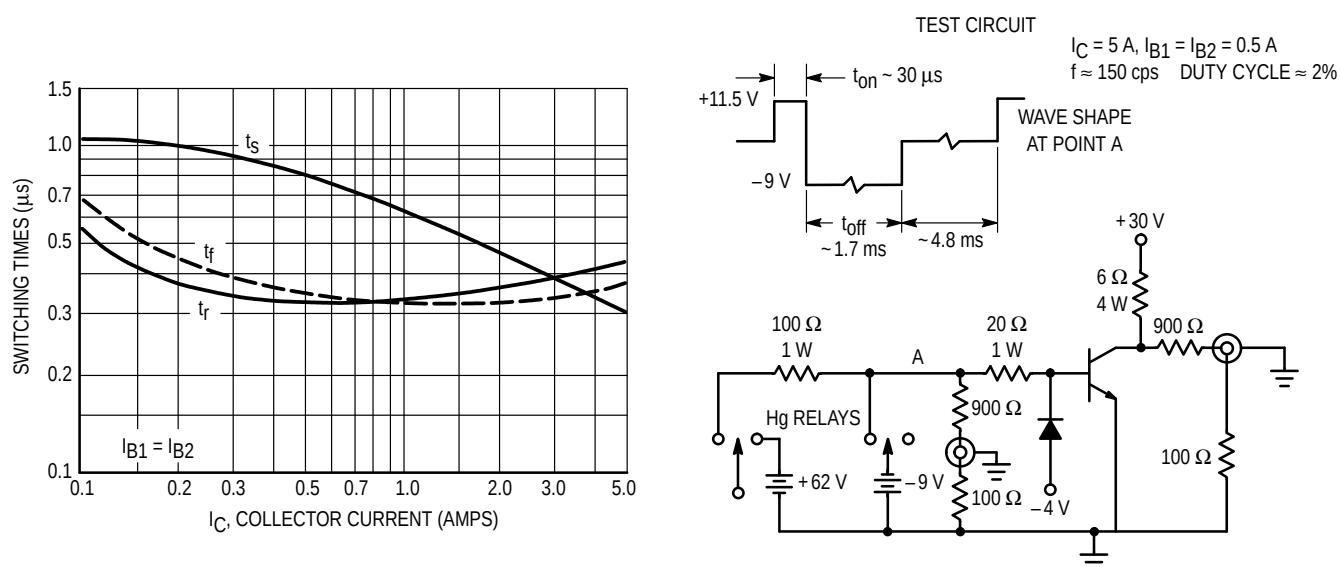
(1) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

Figure 2. Typical Switching Times

2N3715 2N3716

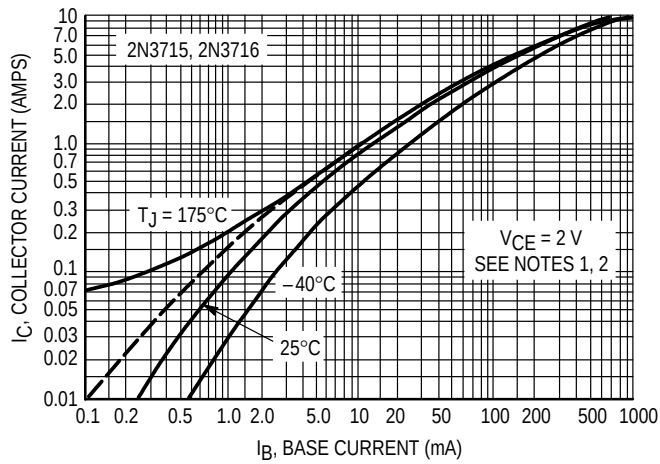


Figure 3. Collector Current versus Base Current

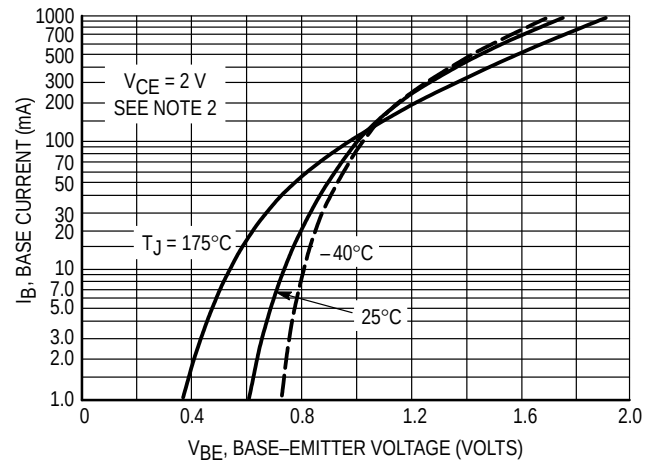


Figure 4. Base Current-Voltage Variations

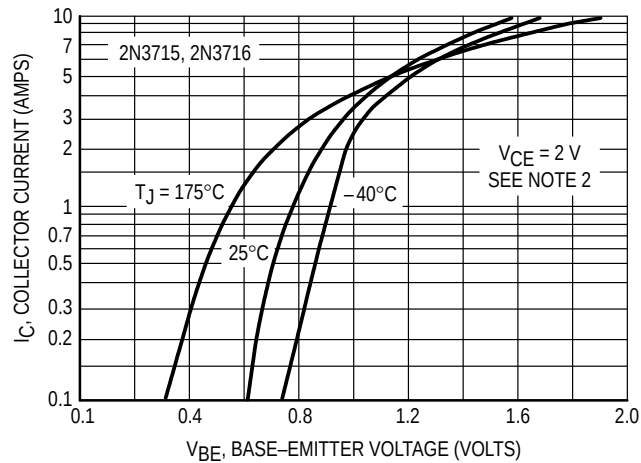


Figure 5. Collector Current-Voltage Variations

NOTE 1. Dotted line indicates metered base current plus the I_{CBO} of the transistor at 175°C .

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

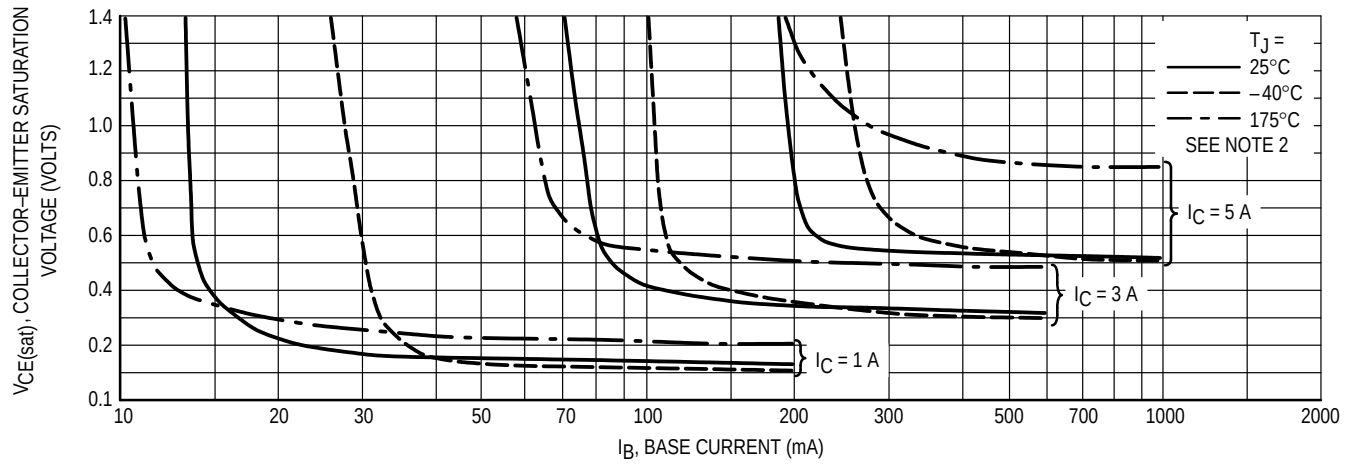


Figure 6. Collector-Emitter Saturation Voltage Variations

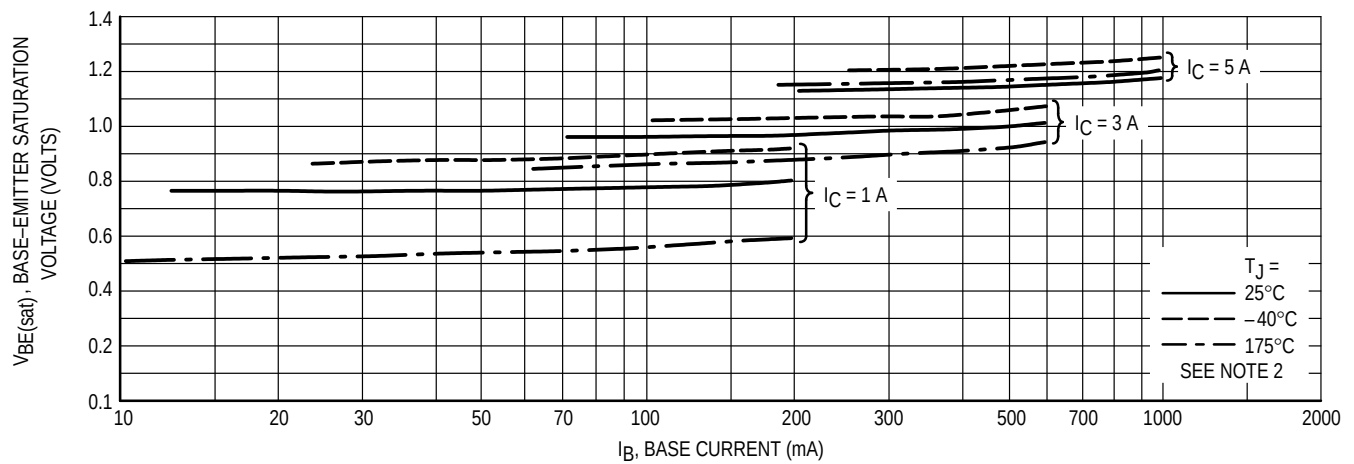


Figure 7. Base-Emitter Saturation Voltage Variations

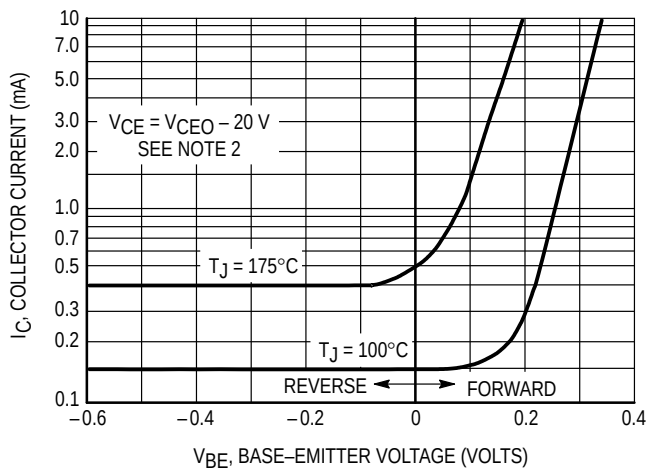


Figure 8. Collector Current versus Base-Emitter Voltage

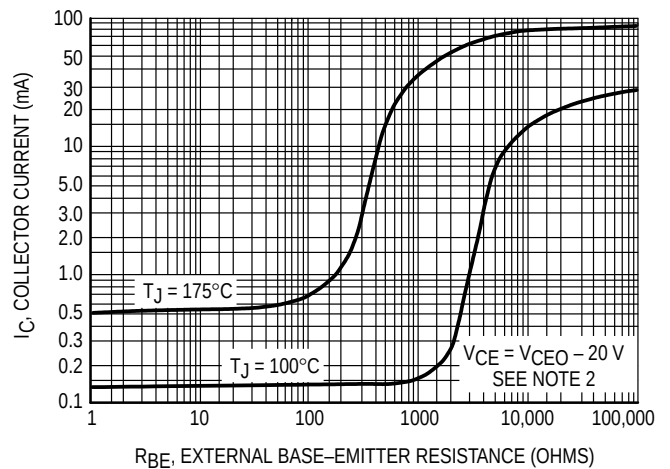


Figure 9. Collector Current versus Base-Emitter Resistance

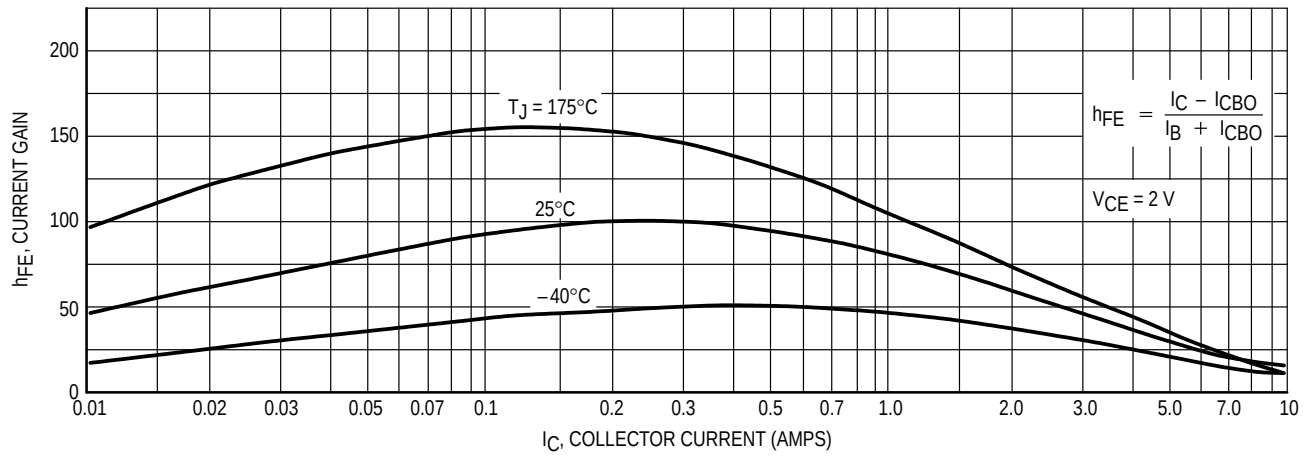


Figure 10. Current Gain Variations

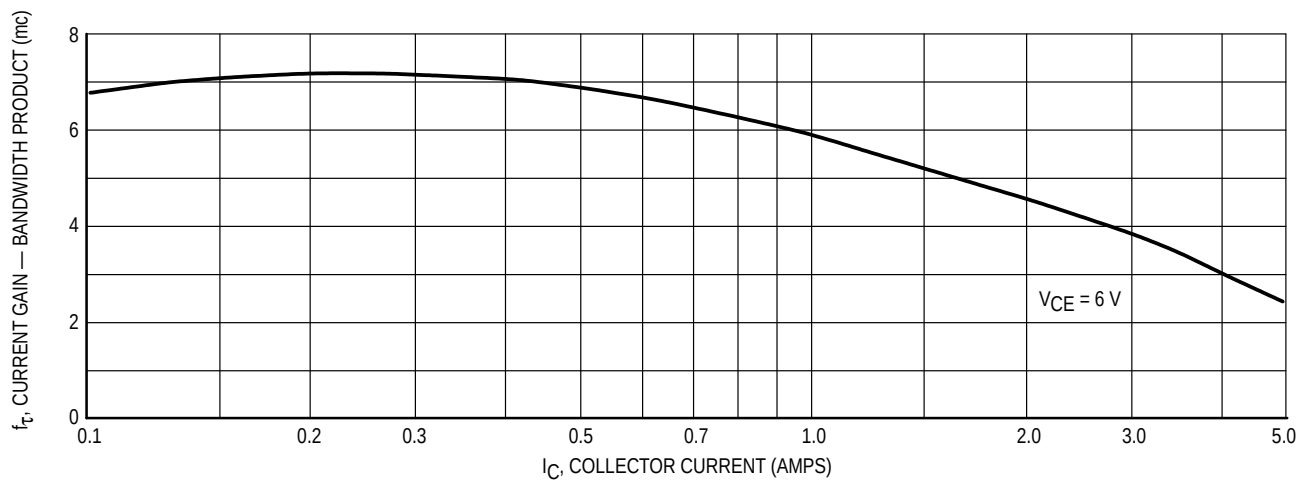


Figure 11. Current Gain — Bandwidth Product versus Collector Current

SAFE OPERATING AREAS

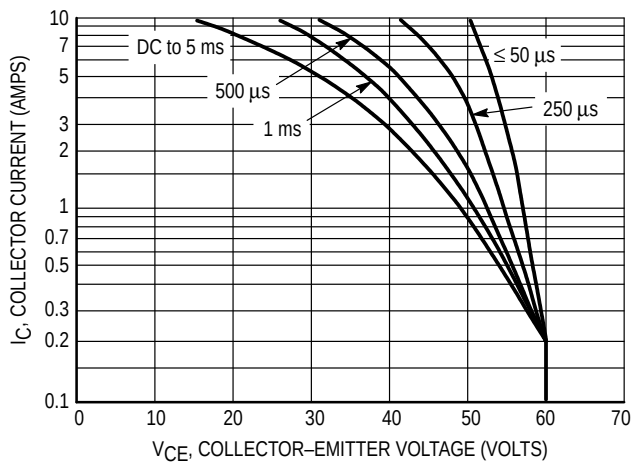


Figure 12. 2N3715

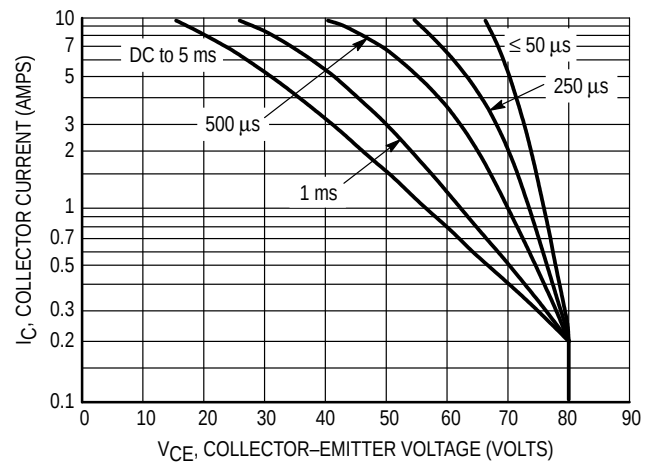
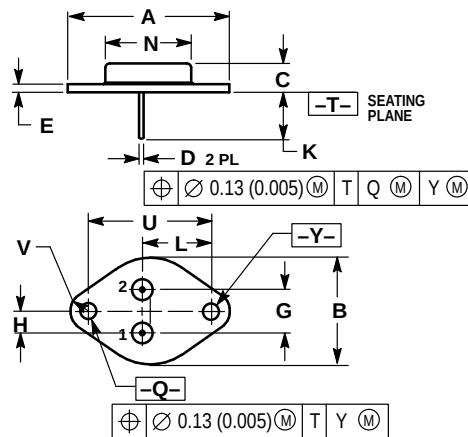


Figure 13. 2N3716

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
- EMITTER
- CASE: COLLECTOR

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

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