

## High-Power PNP Silicon Transistors

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

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

### 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<br>Peak                                                 | $I_C$          | 25<br>50    |        | Adc                          |
| Base Current                                                                           | $I_B$          | 10          |        | Adc                          |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 200<br>1.14 |        | Watts<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$ | -65 to +200 |        | $^\circ\text{C}$             |

### THERMAL CHARACTERISTICS

| Characteristic                       | Symbol          | Max   | Unit               |
|--------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 0.875 | $^\circ\text{C/W}$ |

(1) Indicates JEDEC Registered Data.

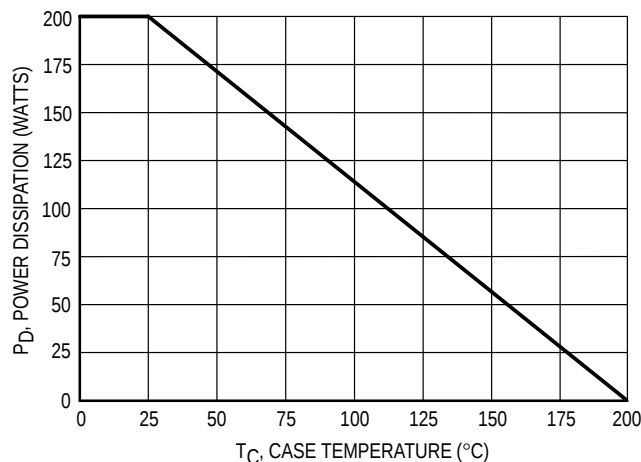


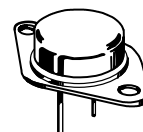
Figure 1. Power Derating

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

**2N6437**  
**2N6438\***

\*Motorola Preferred Device

**25 AMPERE**  
**POWER TRANSISTORS**  
**PNP SILICON**  
**100, 120 VOLTS**  
**200 WATTS**



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

## 2N6437 2N6438

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

| Characteristic                                                                                                                                                                                                                                                                                                                                               | Symbol        | Min              | Max                    | Unit                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|------------------------|---------------------------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                                                                                                                                                                                   |               |                  |                        |                                 |
| Collector–Emitter Sustaining Voltage (1)<br>( $I_C = 50\text{ mA}$ , $I_B = 0$ )                                                                                                                                                                                                                                                                             | $V_{CE(sus)}$ | 100<br>120       | —<br>—                 | Vdc                             |
| Collector Cutoff Current<br>( $V_{CE} = 50\text{ Vdc}$ , $I_B = 0$ )<br>( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )                                                                                                                                                                                                                                             | $I_{CEO}$     | —<br>—           | 50<br>50               | $\mu\text{Adc}$                 |
| Collector Cutoff Current<br>( $V_{CE} = 110\text{ Vdc}$ , $V_{BE(off)} = -1.5\text{ Vdc}$ )<br>( $V_{CE} = 130\text{ Vdc}$ , $V_{BE(off)} = -1.5\text{ Vdc}$ )<br>( $V_{CE} = 100\text{ Vdc}$ , $V_{BE(off)} = -1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )<br>( $V_{CE} = 120\text{ Vdc}$ , $V_{BE(off)} = -1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ ) | $I_{CEX}$     | —<br>—<br>—<br>— | 10<br>10<br>1.0<br>1.0 | $\mu\text{Adc}$<br><br><br>mAdc |
| Collector Cutoff Current<br>( $V_{CB} = 120\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 140\text{ Vdc}$ , $I_E = 0$ )                                                                                                                                                                                                                                           | $I_{CBO}$     | —<br>—           | 10<br>10               | $\mu\text{Adc}$                 |
| Emitter Cutoff Current ( $V_{EB} = 6.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                                                                                                                                                                                                             | $I_{EBO}$     | —                | 100                    | $\mu\text{Adc}$                 |

### ON CHARACTERISTICS

|                                                                                                                                                                                                 |               |                |               |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|---------------|-----|
| DC Current Gain (1)<br>( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 2.0\text{ Vdc}$ )<br>( $I_C = 10\text{ Adc}$ , $V_{CE} = 2.0\text{ Vdc}$ )<br>( $I_C = 25\text{ Adc}$ , $V_{CE} = 2.0\text{ Vdc}$ ) | $h_{FE}$      | 30<br>20<br>12 | —<br>120<br>— | —   |
| Collector–Emitter Saturation Voltage (1)<br>( $I_C = 10\text{ Adc}$ , $I_B = 1.0\text{ Adc}$ )<br>( $I_C = 25\text{ Adc}$ , $I_B = 2.5\text{ Adc}$ )                                            | $V_{CE(sat)}$ | —<br>—         | 1.0<br>1.8    | Vdc |
| Base–Emitter Saturation Voltage (1)<br>( $I_C = 10\text{ Adc}$ , $I_B = 1.0\text{ Adc}$ )<br>( $I_C = 25\text{ Adc}$ , $I_B = 2.5\text{ Adc}$ )                                                 | $V_{BE(sat)}$ | —<br>—         | 1.8<br>2.5    | Vdc |

### DYNAMIC CHARACTERISTICS

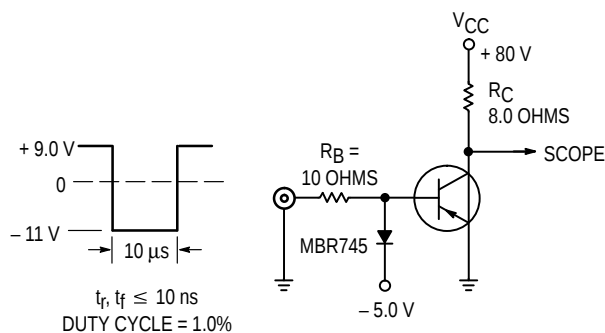
|                                                                                                                            |          |    |     |     |
|----------------------------------------------------------------------------------------------------------------------------|----------|----|-----|-----|
| Current–Gain — Bandwidth Product ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{\text{test}} = 10\text{ MHz}$ ) | $f_T$    | 40 | —   | MHz |
| Output Capacitance ( $V_{CE} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 100\text{ kHz}$ )                                         | $C_{ob}$ | —  | 700 | pF  |

### SWITCHING CHARACTERISTICS

|                                                                                                                                    |       |   |      |               |
|------------------------------------------------------------------------------------------------------------------------------------|-------|---|------|---------------|
| Rise Time ( $V_{CC} = 80\text{ Vdc}$ , $I_C = 10\text{ A}$ , $V_{BE(off)} = 6.0\text{ Vdc}$ , $I_{B1} = 1.0\text{ Adc}$ )          | $t_r$ | — | 0.3  | $\mu\text{s}$ |
| Storage ( $V_{CC} = 80\text{ Vdc}$ , $I_C = 10\text{ A}$ , $V_{BE(off)} = 6.0\text{ Vdc}$ , $I_{B1} = I_{B2} = 1.0\text{ Adc}$ )   | $t_s$ | — | 1.0  | $\mu\text{s}$ |
| Fall Time ( $V_{CC} = 80\text{ Vdc}$ , $I_C = 10\text{ A}$ , $V_{BE(off)} = 6.0\text{ Vdc}$ , $I_{B1} = I_{B2} = 1.0\text{ Adc}$ ) | $t_f$ | — | 0.25 | $\mu\text{s}$ |

\* Indicates JEDEC Registered Data.

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



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

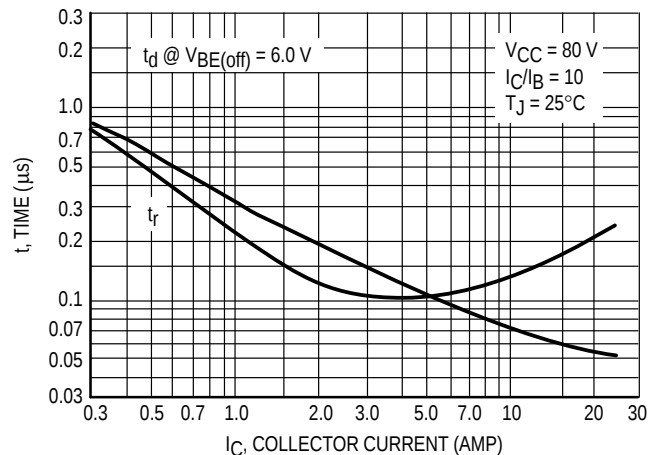


Figure 3. Turn-On Time

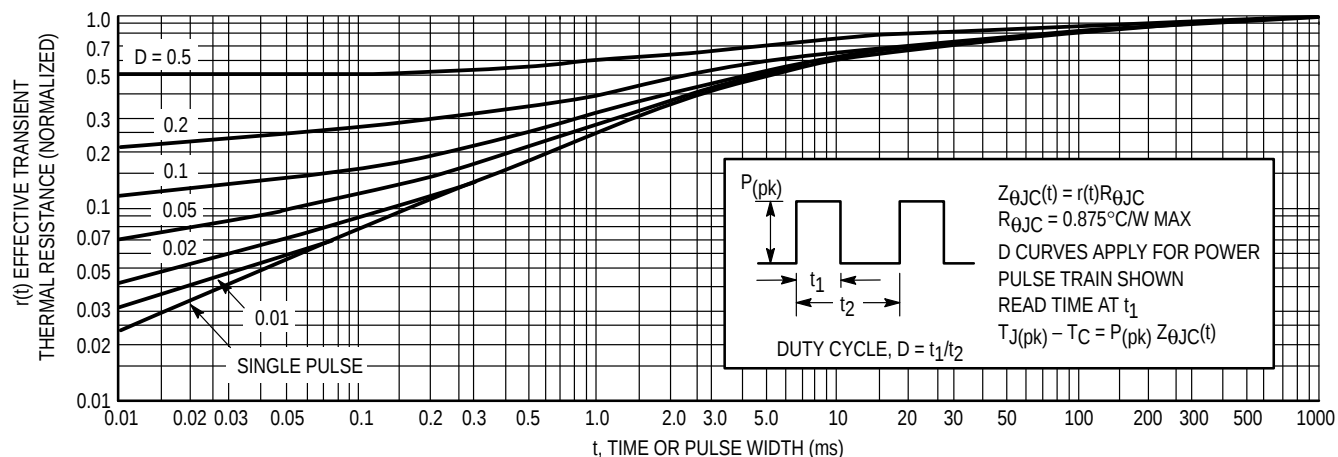


Figure 4. Thermal Response

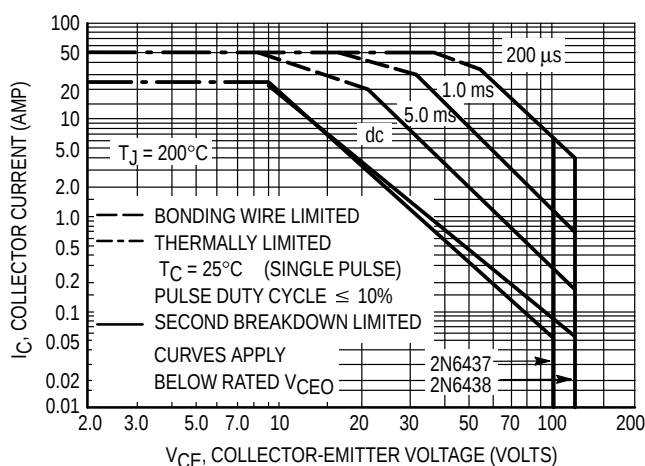


Figure 5. Active Region Safe Operating Area

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  $T_J(pk) \leq 200^\circ\text{C}$ .  $T_J(pk)$  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.

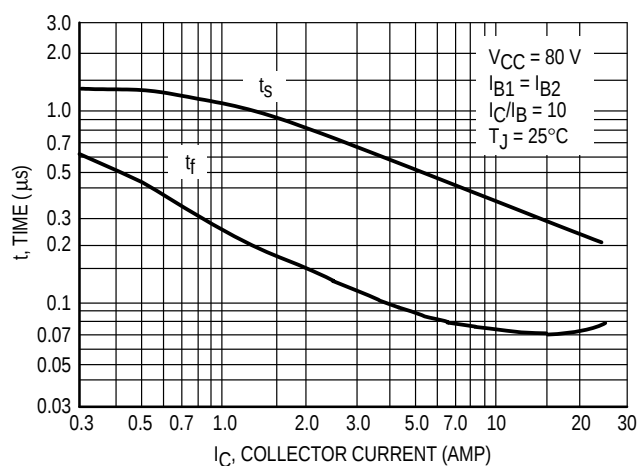


Figure 6. Turn-Off Time

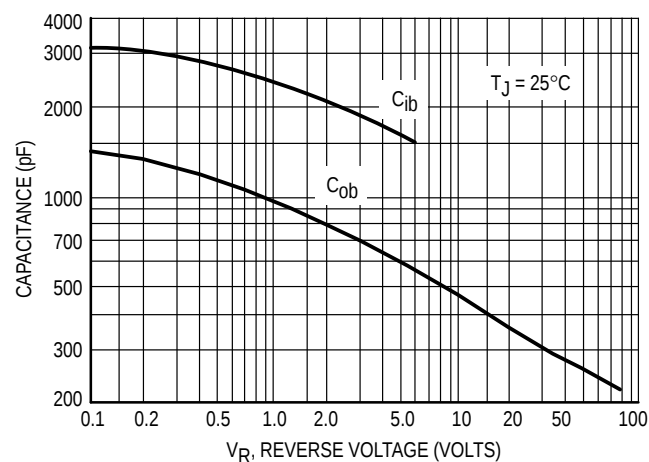


Figure 7. Capacitance

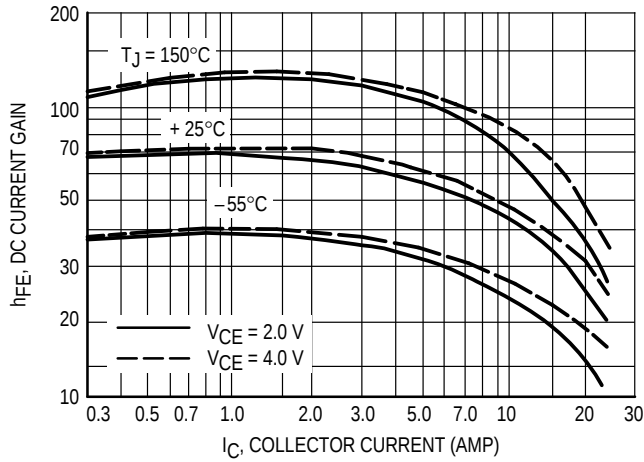


Figure 8. DC Current Gain

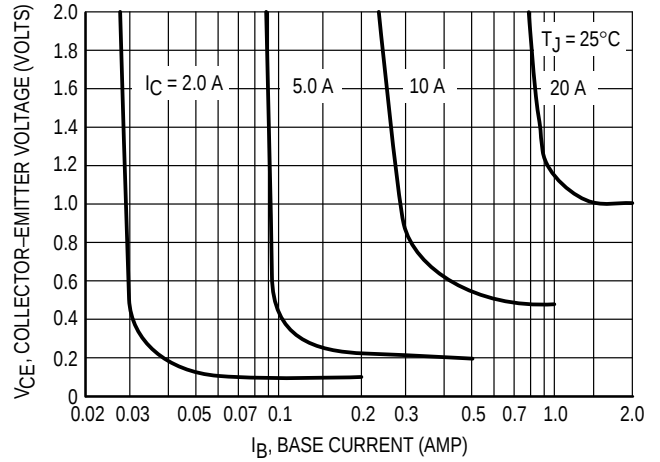


Figure 9. Collector Saturation Region

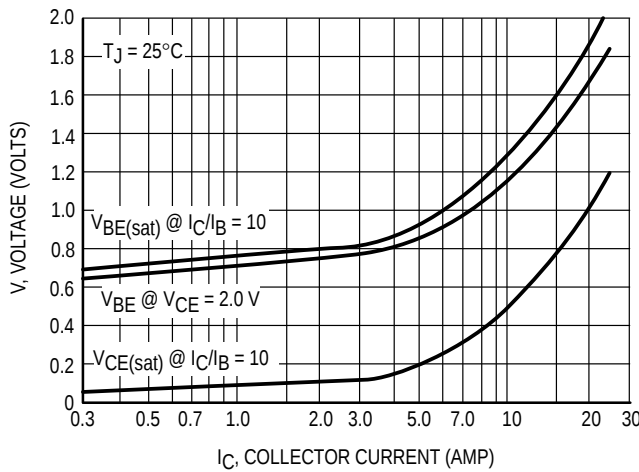


Figure 10. "On" Voltages

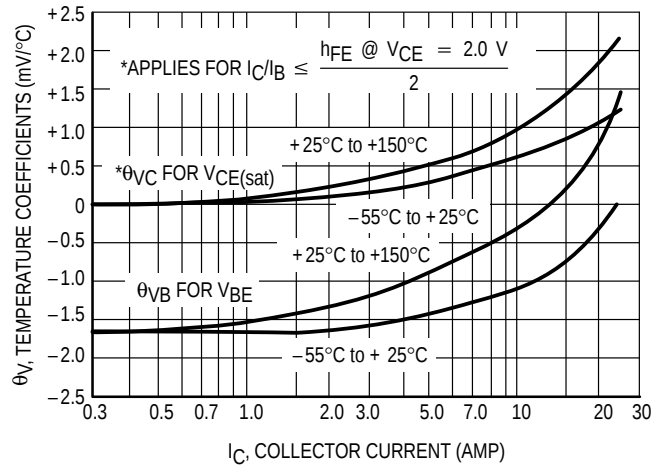


Figure 11. Temperature Coefficients

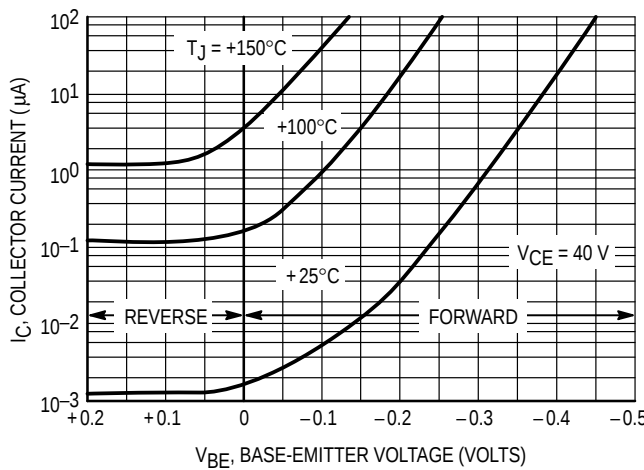


Figure 12. Collector Cut-Off Region

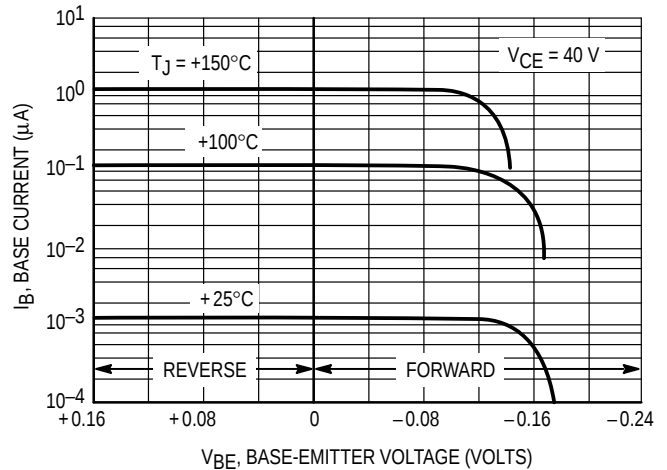
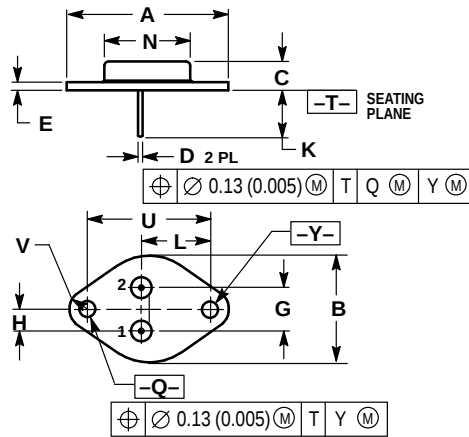


Figure 13. Base Cutoff Region

## PACKAGE DIMENSIONS



## 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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