

# TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

## Complementary Silicon Plastic Power Transistors

Designed for use in general purpose amplifier and switching applications.

### Features

- ESD Ratings: Machine Model, C; > 400 V  
Human Body Model, 3B; > 8000 V
- Epoxy Meets UL 94 V-0 @ 0.125 in
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

| Rating                                                                                          | Symbol         | Value                 | Unit                     |
|-------------------------------------------------------------------------------------------------|----------------|-----------------------|--------------------------|
| Collector-Emitter Voltage<br>TIP41, TIP42<br>TIP41A, TIP42A<br>TIP41B, TIP42B<br>TIP41C, TIP42C | $V_{CEO}$      | 40<br>60<br>80<br>100 | Vdc                      |
| Collector-Base Voltage<br>TIP41, TIP42<br>TIP41A, TIP42A<br>TIP41B, TIP42B<br>TIP41C, TIP42C    | $V_{CB}$       | 40<br>60<br>80<br>100 | Vdc                      |
| Emitter-Base Voltage                                                                            | $V_{EB}$       | 5.0                   | Vdc                      |
| Collector Current—<br>Continuous<br>Peak                                                        | $I_C$          | 6.0<br>10             | Adc                      |
| Base Current                                                                                    | $I_B$          | 2.0                   | Adc                      |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$           | $P_D$          | 65<br>0.52            | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$           | $P_D$          | 2.0<br>0.016          | W<br>W/ $^\circ\text{C}$ |
| Unclamped Inductive Load Energy<br>(Note 1)                                                     | E              | 62.5                  | mJ                       |
| Operating and Storage Junction,<br>Temperature Range                                            | $T_J, T_{stg}$ | -65 to<br>+150        | $^\circ\text{C}$         |

### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max  | Unit               |
|-----------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 1.67 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 57   | $^\circ\text{C/W}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1.  $I_C = 2.5\text{ A}$ ,  $L = 20\text{ mH}$ , P.R.F. = 10 Hz,  $V_{CC} = 10\text{ V}$ ,  $R_{BE} = 100\ \Omega$ .

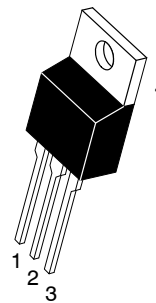
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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## 6 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 40-60-80-100 VOLTS, 65 WATTS



TO-220AB  
CASE 221A  
STYLE 1

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

### MARKING DIAGRAM



TIP4xx = Device Code  
xx = 1, 1A, 1B, 1C  
2, 2A, 2B, 2C  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

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

| Characteristic                                                                                                                                                                                                                        | Symbol                                                             | Min                   | Max                   | Unit                     |      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------|-----------------------|--------------------------|------|
| OFF CHARACTERISTICS                                                                                                                                                                                                                   |                                                                    |                       |                       |                          |      |
| Collector–Emitter Sustaining Voltage (Note 2)<br>(I <sub>C</sub> = 30 mAdc, I <sub>B</sub> = 0)                                                                                                                                       | TIP41, TIP42<br>TIP41A, TIP42A<br>TIP41B, TIP42B<br>TIP41C, TIP42C | V <sub>CEO(sus)</sub> | 40<br>60<br>80<br>100 | –<br>–<br>–<br>–         | Vdc  |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 30 Vdc, I <sub>B</sub> = 0)<br>(V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0)                                                                                                          | TIP41, TIP41A, TIP42, TIP42A<br>TIP41B, TIP41C, TIP42B, TIP42C     | I <sub>CEO</sub>      | –<br>–                | 0.7<br>0.7               | mAdc |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 40 Vdc, V <sub>EB</sub> = 0)<br>(V <sub>CE</sub> = 60 Vdc, V <sub>EB</sub> = 0)<br>(V <sub>CE</sub> = 80 Vdc, V <sub>EB</sub> = 0)<br>(V <sub>CE</sub> = 100 Vdc, V <sub>EB</sub> = 0) | TIP41, TIP42<br>TIP41A, TIP42A<br>TIP41B, TIP42B<br>TIP41C, TIP42C | I <sub>CES</sub>      | –<br>–<br>–<br>–      | 400<br>400<br>400<br>400 | μAdc |
| Emitter Cutoff Current (V <sub>BE</sub> = 5.0 Vdc, I <sub>C</sub> = 0)                                                                                                                                                                |                                                                    | I <sub>EBO</sub>      | –                     | 1.0                      | mAdc |

## ON CHARACTERISTICS (Note 2)

|                                                                                                                                |                      |          |         |     |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------|----------|---------|-----|
| DC Current Gain (I <sub>C</sub> = 0.3 Adc, V <sub>CE</sub> = 4.0 Vdc)<br>(I <sub>C</sub> = 3.0 Adc, V <sub>CE</sub> = 4.0 Vdc) | h <sub>FE</sub>      | 30<br>15 | –<br>75 | –   |
| Collector–Emitter Saturation Voltage (I <sub>C</sub> = 6.0 Adc, I <sub>B</sub> = 600 mAdc)                                     | V <sub>CE(sat)</sub> | –        | 1.5     | Vdc |
| Base–Emitter On Voltage (I <sub>C</sub> = 6.0 Adc, V <sub>CE</sub> = 4.0 Vdc)                                                  | V <sub>BE(on)</sub>  | –        | 2.0     | Vdc |

## DYNAMIC CHARACTERISTICS

|                                                                                                                     |                 |     |   |     |
|---------------------------------------------------------------------------------------------------------------------|-----------------|-----|---|-----|
| Current–Gain — Bandwidth Product (I <sub>C</sub> = 500 mAdc, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 1.0 MHz) | f <sub>T</sub>  | 3.0 | – | MHz |
| Small–Signal Current Gain (I <sub>C</sub> = 0.5 Adc, V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)                         | h <sub>fe</sub> | 20  | – | –   |

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

## ORDERING INFORMATION

| Device  | Package             | Shipping        |
|---------|---------------------|-----------------|
| TIP41   | TO–220              | 50 Units / Rail |
| TIP41G  | TO–220<br>(Pb–Free) | 50 Units / Rail |
| TIP41A  | TO–220              | 50 Units / Rail |
| TIP41AG | TO–220<br>(Pb–Free) | 50 Units / Rail |
| TIP41B  | TO–220              | 50 Units / Rail |
| TIP41BG | TO–220<br>(Pb–Free) | 50 Units / Rail |
| TIP41C  | TO–220              | 50 Units / Rail |
| TIP41CG | TO–220<br>(Pb–Free) | 50 Units / Rail |
| TIP42   | TO–220              | 50 Units / Rail |
| TIP42G  | TO–220<br>(Pb–Free) | 50 Units / Rail |
| TIP42A  | TO–220              | 50 Units / Rail |
| TIP42AG | TO–220<br>(Pb–Free) | 50 Units / Rail |
| TIP42B  | TO–220              | 50 Units / Rail |
| TIP42BG | TO–220<br>(Pb–Free) | 50 Units / Rail |
| TIP42C  | TO–220              | 50 Units / Rail |
| TIP42CG | TO–220<br>(Pb–Free) | 50 Units / Rail |

# TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

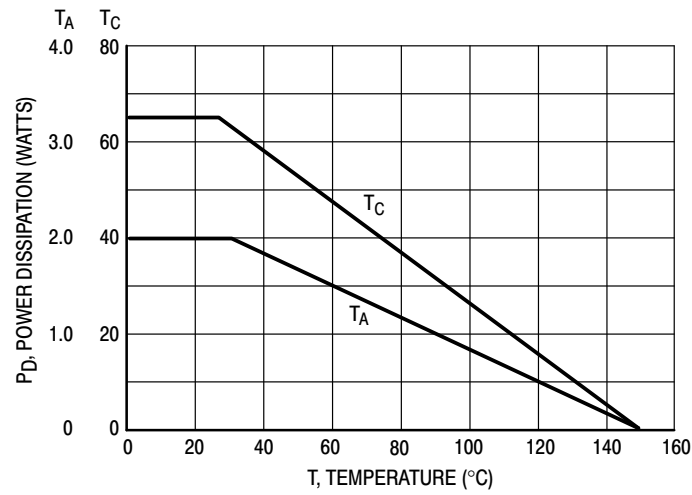


Figure 1. Power Derating

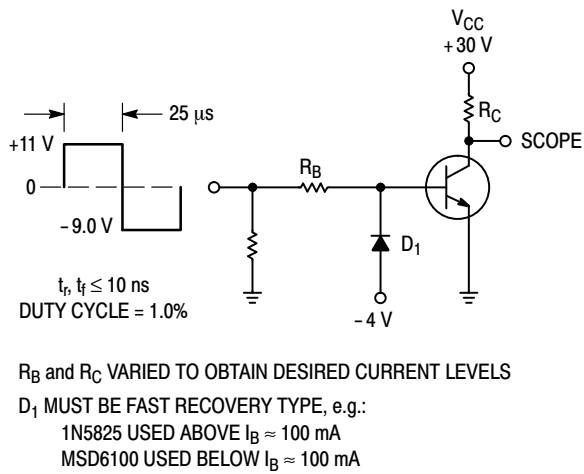


Figure 2. Switching Time Test Circuit

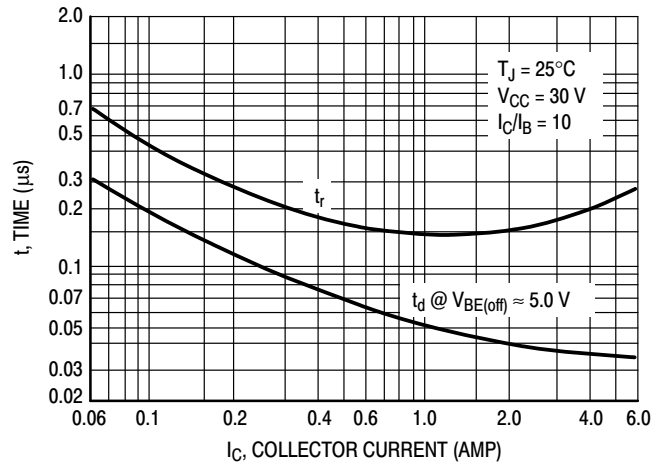


Figure 3. Turn-On Time

# TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

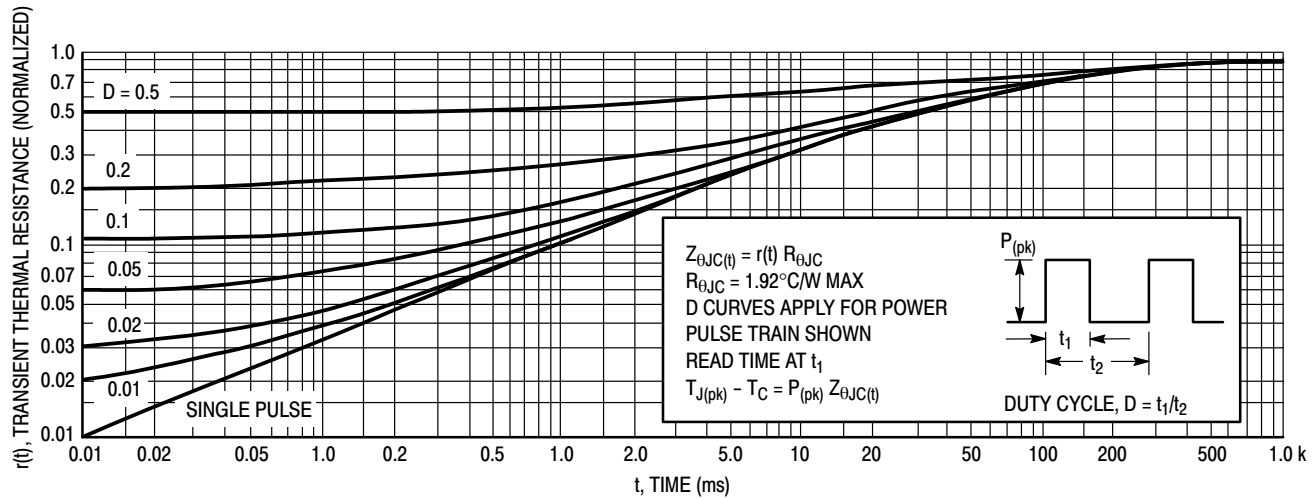


Figure 4. Thermal Response

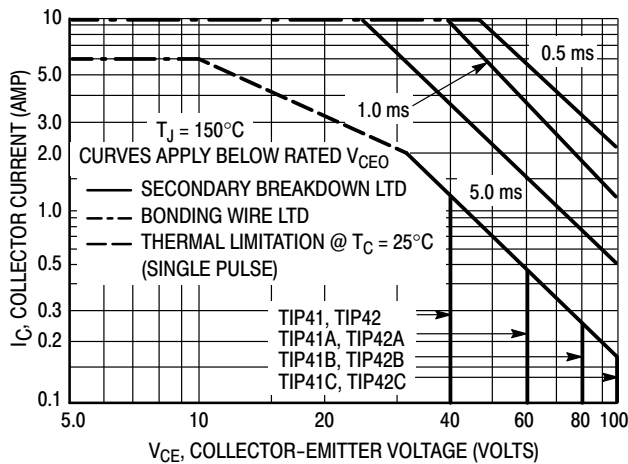


Figure 5. Active-Region Safe Operating Area

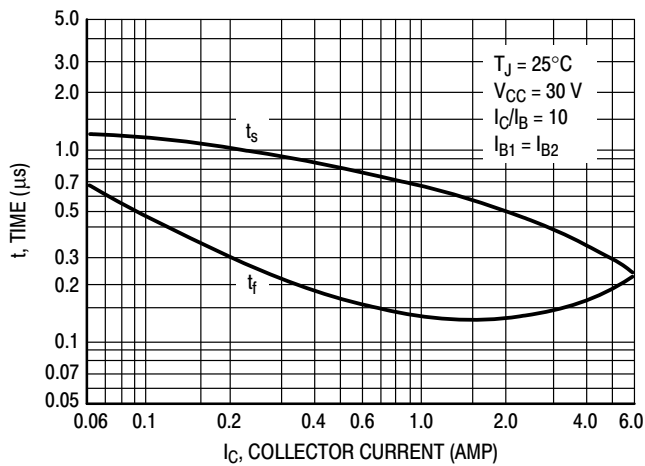


Figure 6. Turn-Off Time

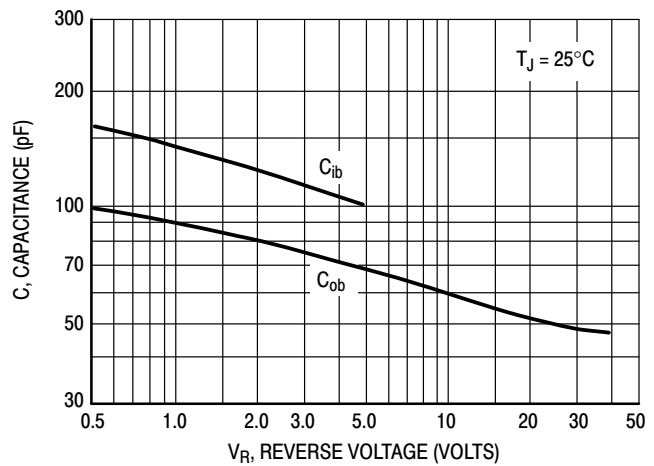


Figure 7. Capacitance

# TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

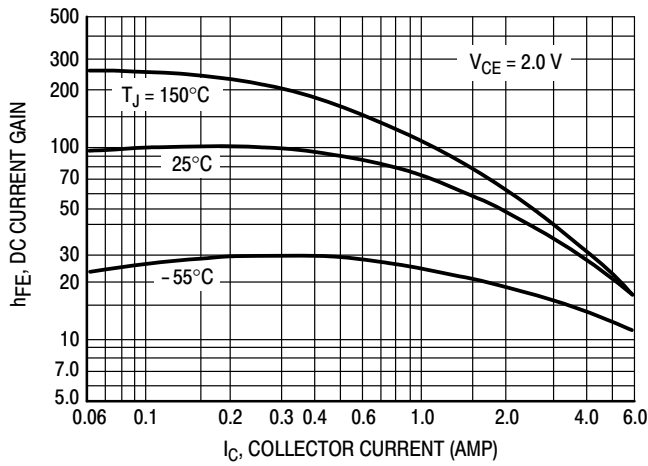


Figure 8. DC Current Gain

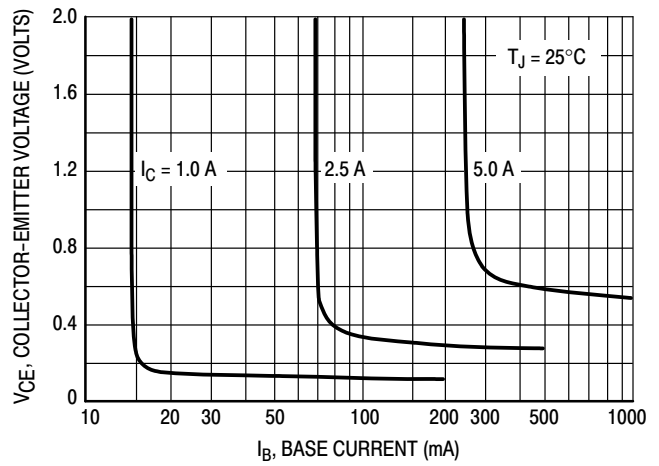


Figure 9. Collector Saturation Region

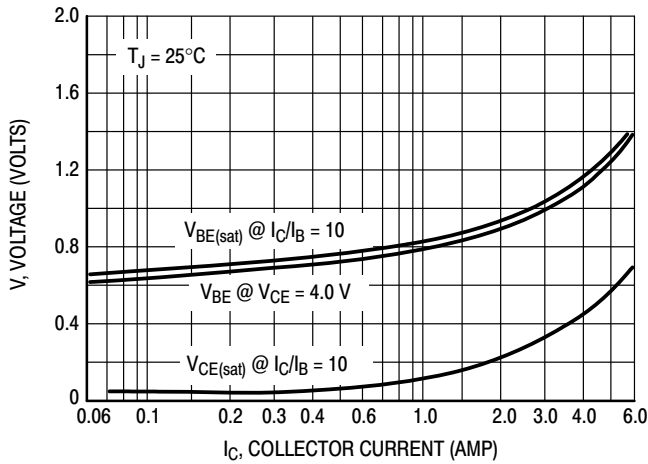


Figure 10. "On" Voltages

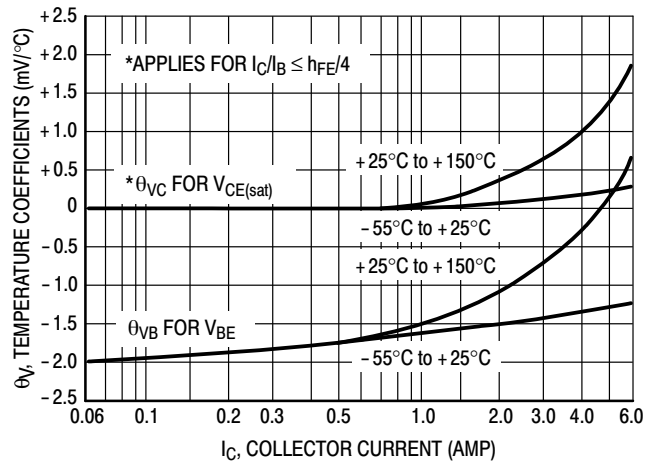


Figure 11. Temperature Coefficients

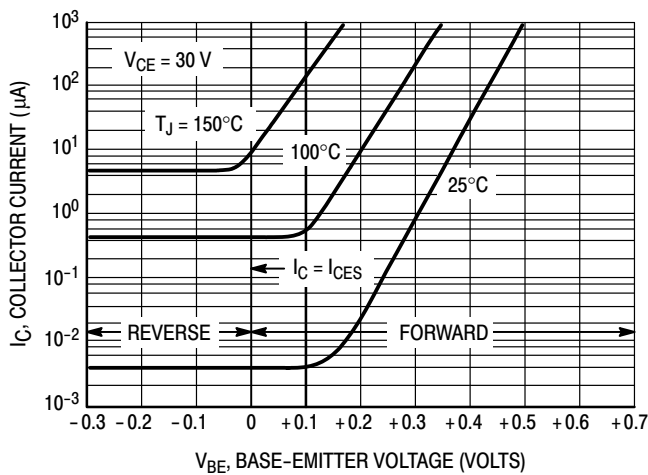


Figure 12. Collector Cut-Off Region

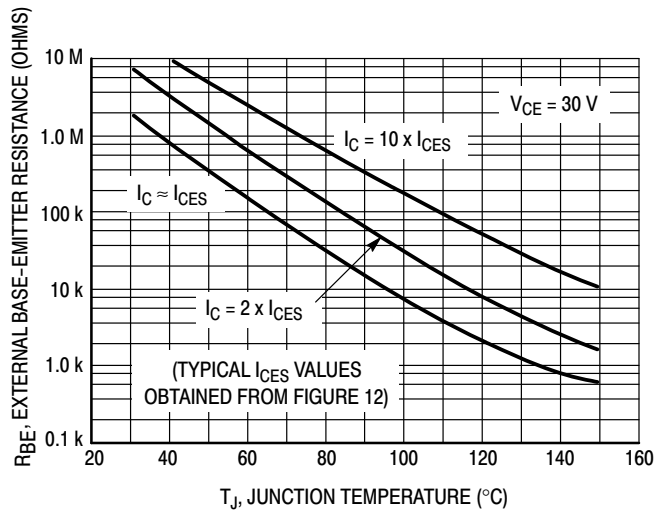
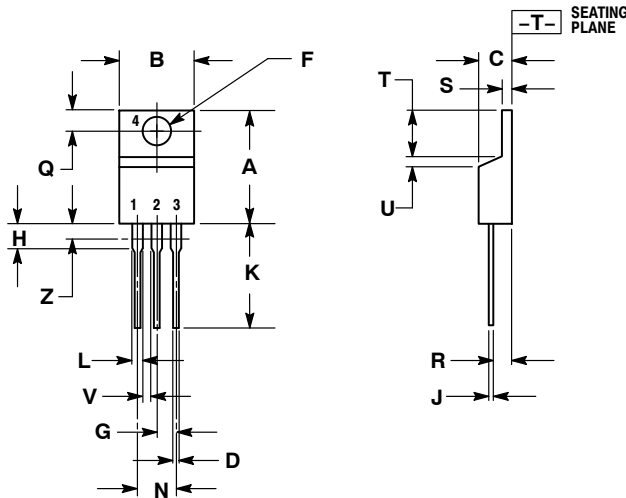


Figure 13. Effects of Base-Emitter Resistance

# TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

## PACKAGE DIMENSIONS

### TO-220 CASE 221A-09 ISSUE AG



#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.570  | 0.620 | 14.48       | 15.75 |
| B   | 0.380  | 0.405 | 9.66        | 10.28 |
| C   | 0.160  | 0.190 | 4.07        | 4.82  |
| D   | 0.025  | 0.036 | 0.64        | 0.91  |
| F   | 0.142  | 0.161 | 3.61        | 4.09  |
| G   | 0.095  | 0.105 | 2.42        | 2.66  |
| H   | 0.110  | 0.161 | 2.80        | 4.10  |
| J   | 0.014  | 0.025 | 0.36        | 0.64  |
| K   | 0.500  | 0.562 | 12.70       | 14.27 |
| L   | 0.045  | 0.060 | 1.15        | 1.52  |
| N   | 0.190  | 0.210 | 4.83        | 5.33  |
| Q   | 0.100  | 0.120 | 2.54        | 3.04  |
| R   | 0.080  | 0.110 | 2.04        | 2.79  |
| S   | 0.045  | 0.055 | 1.15        | 1.39  |
| T   | 0.235  | 0.255 | 5.97        | 6.47  |
| U   | 0.000  | 0.050 | 0.00        | 1.27  |
| V   | 0.045  | ---   | 1.15        | ---   |
| Z   | ---    | 0.080 | ---         | 2.04  |

#### STYLE 1:

1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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