

# TIP41G, TIP41AG, TIP41BG, TIP41CG (NPN), TIP42G, TIP42AG, TIP42BG, TIP42CG (PNP)

## Complementary Silicon Plastic Power Transistors

Designed for use in general purpose amplifier and switching applications.

### Features

- Epoxy Meets UL 94 V-0 @ 0.125 in
- These Devices are Pb-Free and are RoHS Compliant\*

### MAXIMUM RATINGS

| Rating                                                                                                  | Symbol         | Value                 | Unit                     |
|---------------------------------------------------------------------------------------------------------|----------------|-----------------------|--------------------------|
| Collector-Emitter Voltage<br>TIP41G, TIP42G<br>TIP41AG, TIP42AG<br>TIP41BG, TIP42BG<br>TIP41CG, TIP42CG | $V_{CEO}$      | 40<br>60<br>80<br>100 | Vdc                      |
| Collector-Base Voltage<br>TIP41G, TIP42G<br>TIP41AG, TIP42AG<br>TIP41BG, TIP42BG<br>TIP41CG, TIP42CG    | $V_{CB}$       | 40<br>60<br>80<br>100 | Vdc                      |
| Emitter-Base Voltage                                                                                    | $V_{EB}$       | 5.0                   | Vdc                      |
| Collector Current – Continuous                                                                          | $I_C$          | 6.0                   | Adc                      |
| Collector Current – Peak                                                                                | $I_{CM}$       | 10                    | Adc                      |
| Base Current                                                                                            | $I_B$          | 2.0                   | Adc                      |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$                | $P_D$          | 65<br>0.52            | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation<br>@ $T_A = 25^\circ\text{C}$<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 +150           | $^\circ\text{C}$         |
| ESD – Human Body Model                                                                                  | HBM            | 3B                    | V                        |
| ESD – Machine Model                                                                                     | MM             | C                     | V                        |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

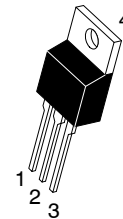
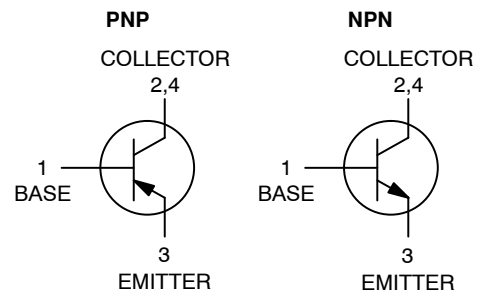
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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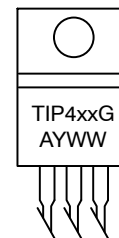
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## 6 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 40–60–80–100 VOLTS, 65 WATTS



TO-220  
CASE 221A  
STYLE 1

### 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 on page 6 of this data sheet.

# TIP41G, TIP41AG, TIP41BG, TIP41CG (NPN), TIP42G, TIP42AG, TIP42BG, TIP42CG (PNP)

## 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   | $^{\circ}\text{C/W}$ |

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                                                                                                                                                                                                         |                |                       |                          |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------|--------------------------|-----------------|
| Collector-Emitter Sustaining Voltage (Note 2)<br>( $I_C = 30 \text{ mAdc}$ , $I_B = 0$ )<br>TIP41G, TIP42G<br>TIP41AG, TIP42AG<br>TIP41BG, TIP42BG<br>TIP41CG, TIP42CG                                                                                                                                  | $V_{CEO(sus)}$ | 40<br>60<br>80<br>100 | –<br>–<br>–<br>–         | Vdc             |
| Collector Cutoff Current<br>( $V_{CE} = 30 \text{ Vdc}$ , $I_B = 0$ )<br>TIP41G, TIP41AG, TIP42G, TIP42AG<br>( $V_{CE} = 60 \text{ Vdc}$ , $I_B = 0$ )<br>TIP41BG, TIP41CG, TIP42BG, TIP42CG                                                                                                            | $I_{CEO}$      | –<br>–                | 0.7<br>0.7               | mAdc            |
| Collector Cutoff Current<br>( $V_{CE} = 40 \text{ Vdc}$ , $V_{EB} = 0$ )<br>TIP41G, TIP42G<br>( $V_{CE} = 60 \text{ Vdc}$ , $V_{EB} = 0$ )<br>TIP41AG, TIP42AG<br>( $V_{CE} = 80 \text{ Vdc}$ , $V_{EB} = 0$ )<br>TIP41BG, TIP42BG<br>( $V_{CE} = 100 \text{ Vdc}$ , $V_{EB} = 0$ )<br>TIP41CG, TIP42CG | $I_{CES}$      | –<br>–<br>–<br>–      | 400<br>400<br>400<br>400 | $\mu\text{Adc}$ |
| Emitter Cutoff Current ( $V_{BE} = 5.0 \text{ Vdc}$ , $I_C = 0$ )                                                                                                                                                                                                                                       | $I_{EBO}$      | –                     | 1.0                      | mAdc            |

### ON CHARACTERISTICS (Note 2)

|                                                                                                                                         |               |          |         |     |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|---------|-----|
| DC Current Gain<br>( $I_C = 0.3 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )<br>( $I_C = 3.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ ) | $h_{FE}$      | 30<br>15 | –<br>75 | –   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 6.0 \text{ Adc}$ , $I_B = 600 \text{ mAdc}$ )                                          | $V_{CE(sat)}$ | –        | 1.5     | Vdc |
| Base-Emitter On Voltage<br>( $I_C = 6.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )                                                     | $V_{BE(on)}$  | –        | 2.0     | Vdc |

### DYNAMIC CHARACTERISTICS

|                                                                                                                             |          |     |   |     |
|-----------------------------------------------------------------------------------------------------------------------------|----------|-----|---|-----|
| Current-Gain – Bandwidth Product<br>( $I_C = 500 \text{ mAdc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f_{test} = 1.0 \text{ MHz}$ ) | $f_T$    | 3.0 | – | MHz |
| Small-Signal Current Gain<br>( $I_C = 0.5 \text{ Adc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f = 1.0 \text{ kHz}$ )                | $h_{fe}$ | 20  | – | –   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

# TIP41G, TIP41AG, TIP41BG, TIP41CG (NPN), TIP42G, TIP42AG, TIP42BG, TIP42CG (PNP)

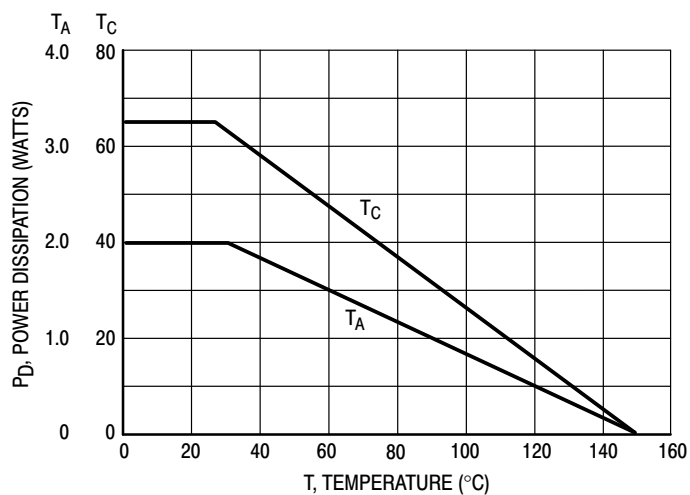
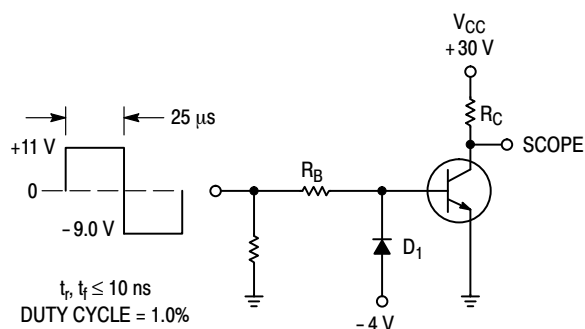


Figure 1. Power Derating



$R_B$  and  $R_C$  VARIED TO OBTAIN DESIRED CURRENT LEVELS

$D_1$  MUST BE FAST RECOVERY TYPE, e.g.:

1N5825 USED ABOVE  $I_B \approx 100$  mA

MSD6100 USED BELOW  $I_B \approx 100$  mA

Figure 2. Switching Time Test Circuit

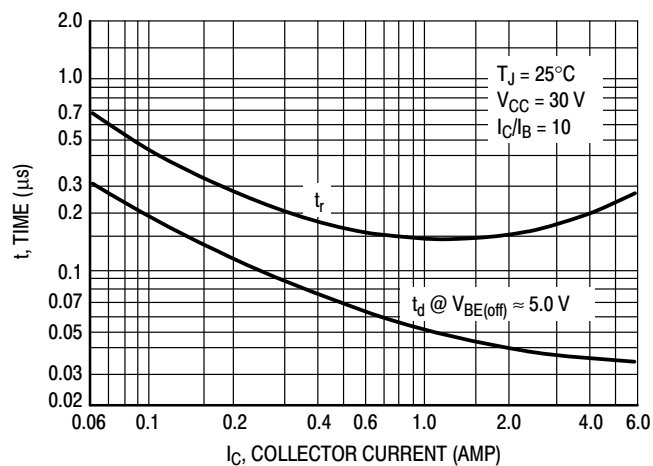


Figure 3. Turn-On Time

# TIP41G, TIP41AG, TIP41BG, TIP41CG (NPN), TIP42G, TIP42AG, TIP42BG, TIP42CG (PNP)

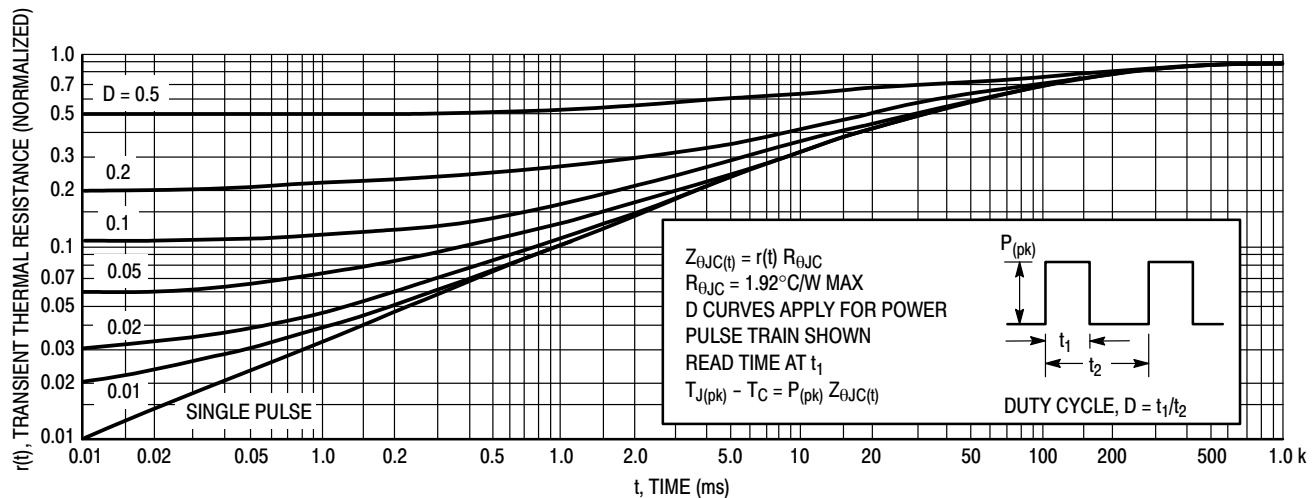


Figure 4. Thermal Response

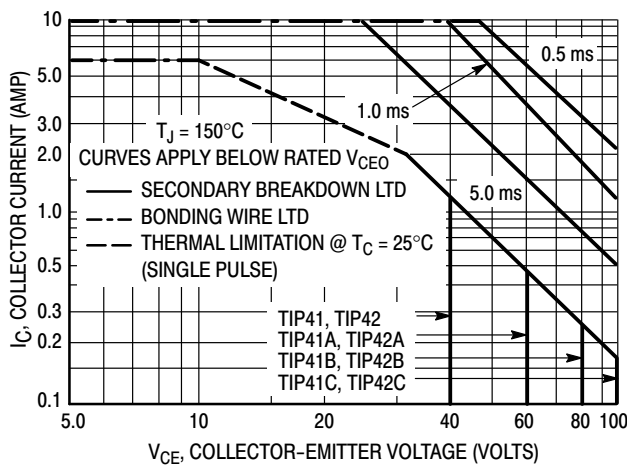


Figure 5. Active-Region Safe Operating Area

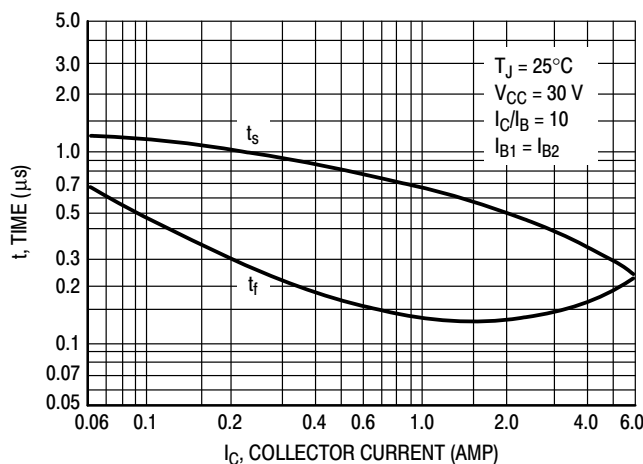


Figure 6. Turn-Off Time

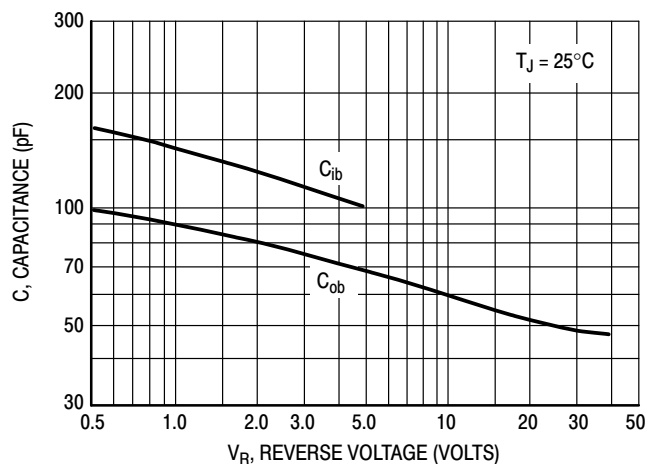
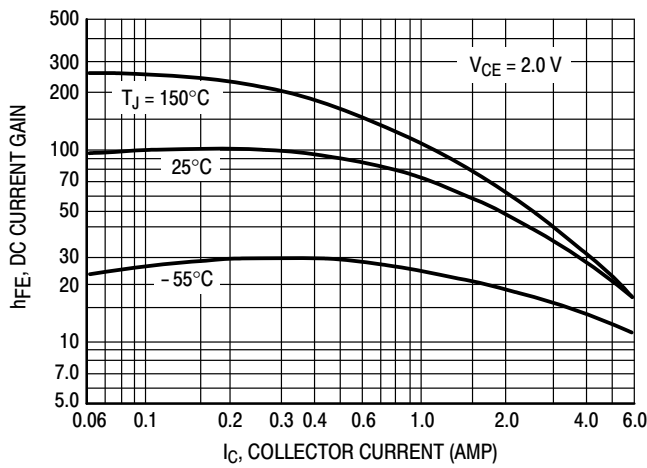
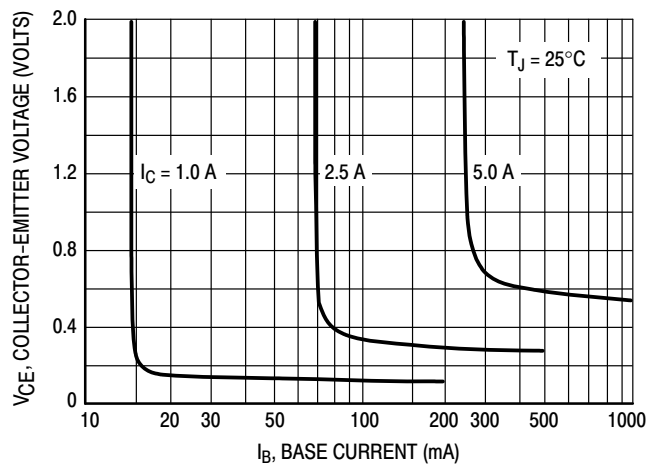


Figure 7. Capacitance

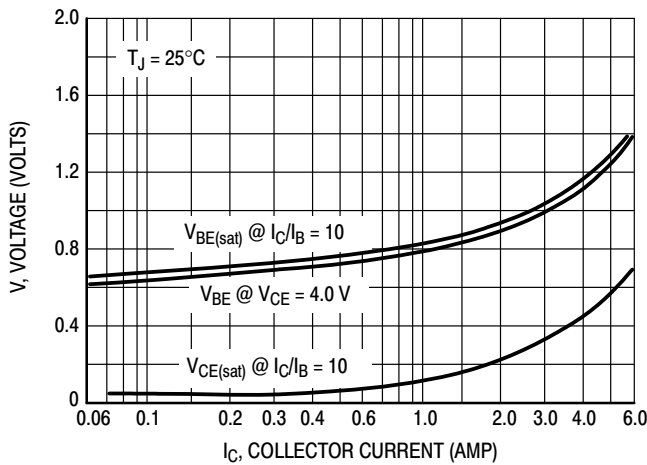
**TIP41G, TIP41AG, TIP41BG, TIP41CG (NPN), TIP42G, TIP42AG, TIP42BG, TIP42CG (PNP)**



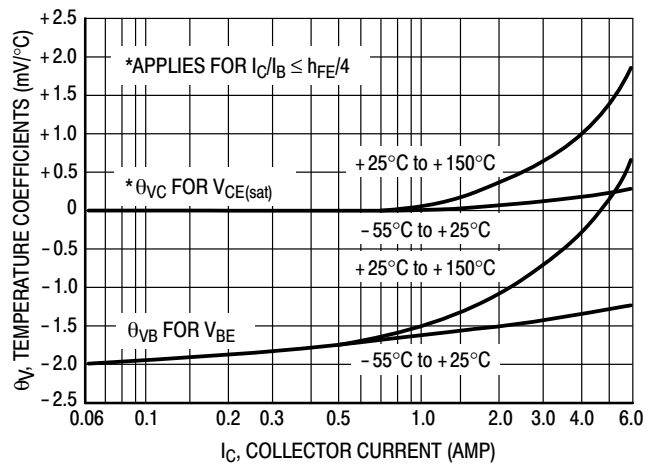
**Figure 8. DC Current Gain**



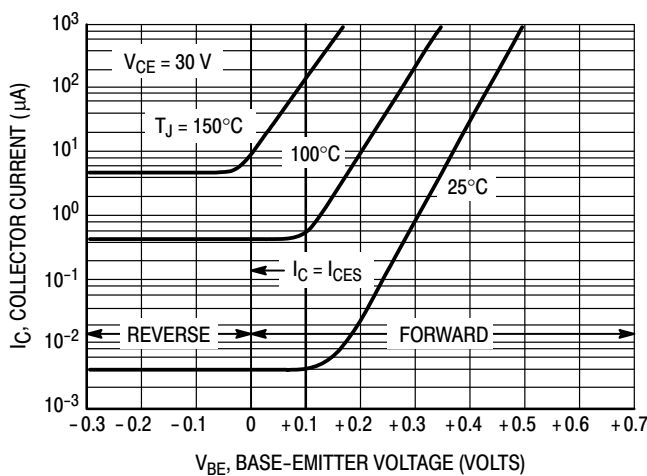
**Figure 9. Collector Saturation Region**



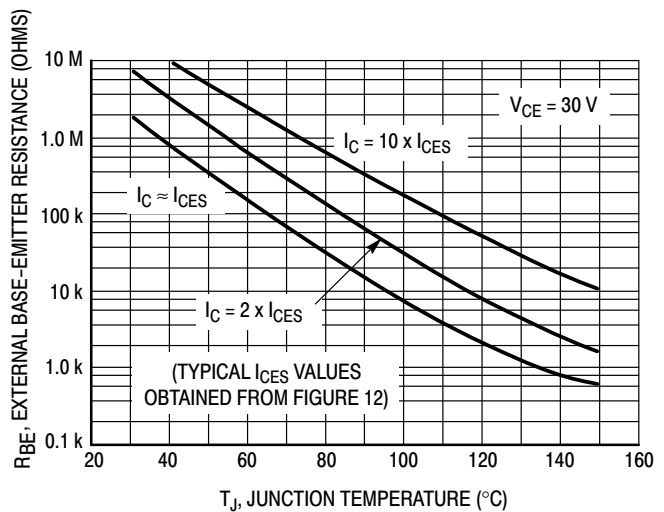
**Figure 10. "On" Voltages**



**Figure 11. Temperature Coefficients**



**Figure 12. Collector Cut-Off Region**



**Figure 13. Effects of Base-Emitter Resistance**

**TIP41G, TIP41AG, TIP41BG, TIP41CG (NPN), TIP42G, TIP42AG, TIP42BG,  
TIP42CG (PNP)**

**ORDERING INFORMATION**

| <b>Device</b> | <b>Package</b>      | <b>Shipping</b> |
|---------------|---------------------|-----------------|
| TIP41G        | TO-220<br>(Pb-Free) | 50 Units / Rail |
| TIP41AG       | TO-220<br>(Pb-Free) | 50 Units / Rail |
| TIP41BG       | TO-220<br>(Pb-Free) | 50 Units / Rail |
| TIP41CG       | TO-220<br>(Pb-Free) | 50 Units / Rail |
| TIP42G        | TO-220<br>(Pb-Free) | 50 Units / Rail |
| TIP42AG       | TO-220<br>(Pb-Free) | 50 Units / Rail |
| TIP42BG       | TO-220<br>(Pb-Free) | 50 Units / Rail |
| TIP42CG       | TO-220<br>(Pb-Free) | 50 Units / Rail |

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