

# TIP131, TIP132 (NPN), TIP137 (PNP)



ON Semiconductor®

<http://onsemi.com>

## Darlington Complementary Silicon Power Transistors

Designed for general-purpose amplifier and low-speed switching applications.

### Features

- High DC Current Gain –  
 $h_{FE} = 2500$  (Typ) @  $I_C$   
 $= 4.0$  Adc
- Collector–Emitter Sustaining Voltage – @ 30 mAdc  
 $V_{CEO(sus)} = 80$  Vdc (Min) – TIP131  
 $= 100$  Vdc (Min) – TIP132, TIP137
- Low Collector–Emitter Saturation Voltage –  
 $V_{CE(sat)} = 2.0$  Vdc (Max) @  $I_C = 4.0$  Adc  
 $= 3.0$  Vdc (Max) @  $I_C = 6.0$  Adc
- Monolithic Construction with Built–In Base–Emitter Shunt Resistors
- Pb–Free Packages are Available\*

### MAXIMUM RATINGS

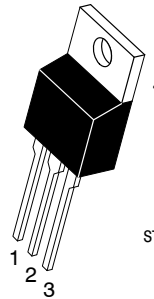
| Rating   | Symbol         | TIP131      | TIP132<br>TIP137 | Unit             |
|--|----------------|-------------|------------------|------------------|
| Collector–Emitter Voltage                          | $V_{CEO}$      | 80          | 100              | Vdc              |
| Collector–Base Voltage                             | $V_{CB}$       | 80          | 100              | Vdc              |
| Emitter–Base Voltage                               | $V_{EB}$       | 5.0         |                  | Vdc              |
| Collector Current – Continuous Peak                | $I_C$          | 8.0<br>12   |                  | Adc              |
| Base Current                                       | $I_B$          | 300         |                  | mAdc             |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | $P_D$          | 70          |                  | W                |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | $P_D$          | 2.0         |                  | W                |
| Operating and Storage Junction, Temperature Range  | $T_J, T_{stg}$ | –65 to +150 |                  | $^\circ\text{C}$ |

### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max  | Unit                      |
|---|-----------------|------|---------------------------|
| Thermal Resistance, Junction–to–Case    | $R_{\theta JC}$ | 1.78 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction–to–Ambient | $R_{\theta JA}$ | 63.5 | $^\circ\text{C}/\text{W}$ |

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.

## DARLINGTON 8 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 80–100 VOLTS, 70 WATTS



TO-220AB  
CASE 221A  
STYLE 1

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

TIP13x = Device Code  
 x = 1, 2, or 7  
 A = Assembly Location  
 Y = Year  
 WW = Work Week  
 G = Pb–Free Package

### MARKING DIAGRAM

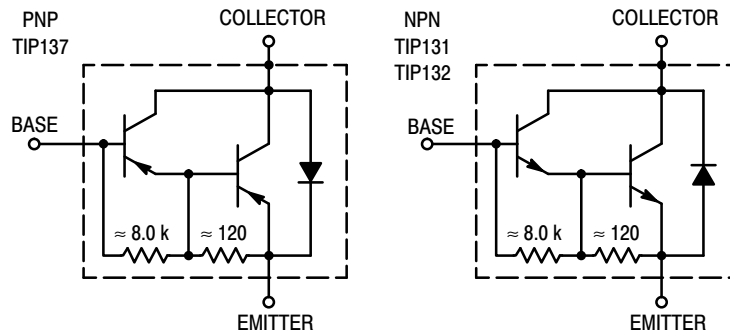


### ORDERING INFORMATION

| Device  | Package             | Shipping      |
|---------|---------------------|---------------|
| TIP131  | TO–220              | 50 Units/Rail |
| TIP131G | TO–220<br>(Pb–Free) | 50 Units/Rail |
| TIP132  | TO–220              | 50 Units/Rail |
| TIP132G | TO–220<br>(Pb–Free) | 50 Units/Rail |
| TIP137  | TO–220              | 50 Units/Rail |
| TIP137G | TO–220<br>(Pb–Free) | 50 Units/Rail |

\*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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**Figure 1. Darlington Circuit Schematic**

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

| Characteristic   | Symbol        | Min         | Max        | Unit |
|--|---------------|-------------|------------|------|
| <b>OFF CHARACTERISTICS</b>   |               |             |            |      |
| Collector–Emitter Sustaining Voltage (Note 1)<br>( $I_C = 30 \text{ mAdc}$ , $I_B = 0$ )   | $V_{CE(sus)}$ | 80<br>100   | –<br>–     | Vdc  |
| Collector Cutoff Current<br>( $V_{CE} = 40 \text{ Vdc}$ , $I_B = 0$ )<br>( $V_{CE} = 50 \text{ Vdc}$ , $I_B = 0$ )                                     | $I_{CEO}$     | –<br>–      | 0.5<br>0.5 | mAdc |
| Collector Cutoff Current<br>( $V_{CB} = 80 \text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 100 \text{ Vdc}$ , $I_E = 0$ )                                    | $I_{CBO}$     | –<br>–      | 0.2<br>0.2 | mAdc |
| Emitter Cutoff Current<br>( $V_{BE} = 5.0 \text{ Vdc}$ , $I_C = 0$ )   | $I_{EBO}$     | –           | 5.0        | mAdc |
| <b>ON CHARACTERISTICS (Note 1)</b>   |               |             |            |      |
| DC Current Gain<br>( $I_C = 1.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )<br>( $I_C = 4.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )                | $h_{FE}$      | 500<br>1000 | –<br>15000 | –    |
| Collector–Emitter Saturation Voltage<br>( $I_C = 4.0 \text{ Adc}$ , $I_B = 16 \text{ mAdc}$ )<br>( $I_C = 6.0 \text{ Adc}$ , $I_B = 30 \text{ mAdc}$ ) | $V_{CE(sat)}$ | –<br>–      | 2.0<br>3.0 | Vdc  |
| Base–Emitter On Voltage<br>( $I_C = 4.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )  | $V_{BE(on)}$  | –           | 2.5        | Vdc  |

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

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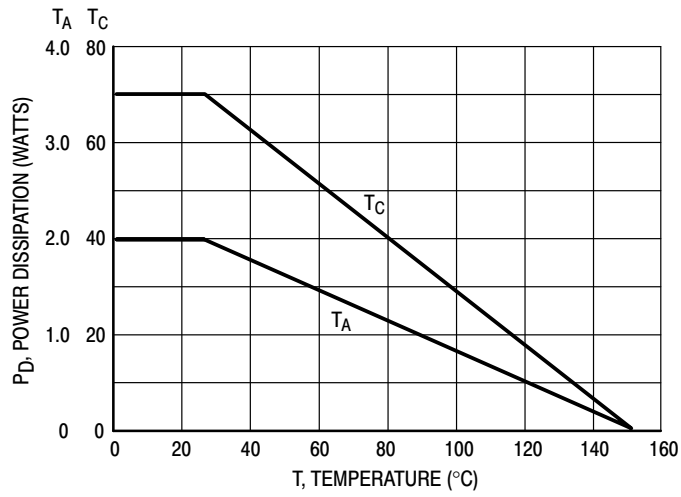


Figure 2. Power Derating

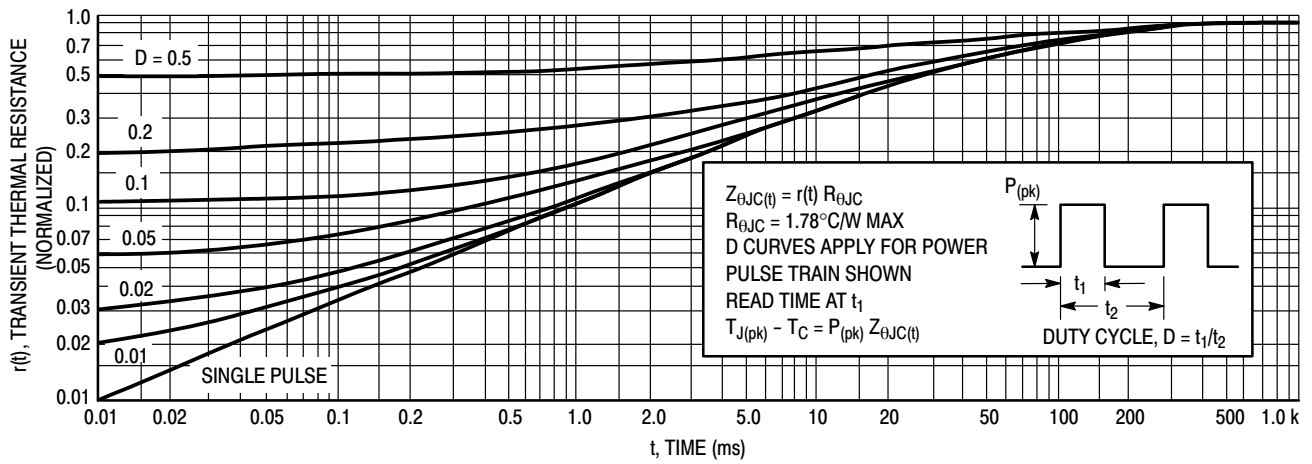
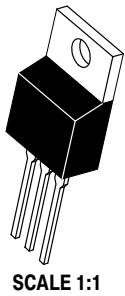


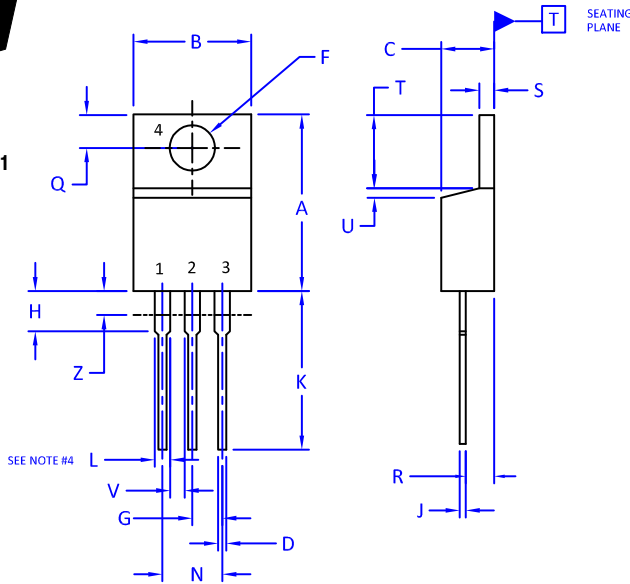
Figure 3. Thermal Response

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



## TO-220 CASE 221A ISSUE AK

DATE 13 JAN 2022



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
  2. CONTROLLING DIMENSION: INCHES
  3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
  4. MAX WIDTH FOR F102 DEVICE = 1.35MM

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN.   | MAX.  | MIN.        | MAX.  |
| A   | 0.570  | 0.620 | 14.48       | 15.75 |
| B   | 0.380  | 0.415 | 9.66        | 10.53 |
| C   | 0.160  | 0.190 | 4.07        | 4.83  |
| D   | 0.025  | 0.038 | 0.64        | 0.96  |
| F   | 0.142  | 0.161 | 3.60        | 4.09  |
| G   | 0.095  | 0.105 | 2.42        | 2.66  |
| H   | 0.110  | 0.161 | 2.80        | 4.10  |
| J   | 0.014  | 0.024 | 0.36        | 0.61  |
| 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        | 1.41  |
| 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:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

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

STYLE 3:  
PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE

STYLE 4:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. MAIN TERMINAL 2

STYLE 5:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

STYLE 6:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. CATHODE

STYLE 7:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. ANODE

STYLE 8:  
PIN 1. CATHODE  
2. ANODE  
3. EXTERNAL TRIP/DELAY  
4. ANODE

STYLE 9:  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

STYLE 10:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN  
4. SOURCE

STYLE 11:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE  
4. SOURCE

STYLE 12:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. NOT CONNECTED

|                  |             |  |
|------------------|-------------|--|
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