

TIP110, TIP111, TIP112 (NPN); TIP115, TIP116, TIP117 (PNP)

TIP111, TIP112, TIP116, and TIP117 are Preferred Devices

Plastic Medium-Power Complementary Silicon Transistors

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

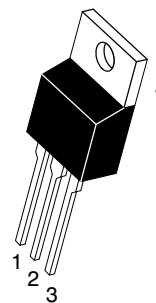
Features

- High DC Current Gain -
 $h_{FE} = 2500$ (Typ) @ I_C
= 1.0 Adc
- Collector-Emitter Sustaining Voltage - @ 30 mAdc
 $V_{CEO(sus)} = 60$ Vdc (Min) - TIP110, TIP115
= 80 Vdc (Min) - TIP111, TIP116
= 100 Vdc (Min) - TIP112, TIP117
- Low Collector-Emitter Saturation Voltage -
 $V_{CE(sat)} = 2.5$ Vdc (Max) @ I_C
= 2.0 Adc
- Monolithic Construction with Built-in Base-Emitter Shunt Resistors
- Pb-Free Packages are Available*



ON Semiconductor®

DARLINGTON 2 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 60-80-100 VOLTS, 50 WATTS



MARKING DIAGRAM



TO-220AB
CASE 221A
STYLE 1

TIP11x = Device Code
x = 0, 1, 2, 5, 6, or 7
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.

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

*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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MAXIMUM RATINGS

| Rating | Symbol | TIP110, TIP115 | TIP111, TIP116 | TIP112, TIP117 | Unit |
|---|----------------|-------------------|-------------------|-------------------|--------------------------|
| Collector-Emitter Voltage | V_{CEO} | 60 | 80 | 100 | Vdc |
| Collector-Base Voltage | V_{CB} | 60 | 80 | 100 | Vdc |
| Emitter-Base Voltage | V_{EB} | 5.0 | | | Vdc |
| Collector Current - Continuous - Peak | I_C | 2.0 4.0 | | | Adc |
| Base Current | I_B | 50 | | | mAdc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 50 0.4 | | | W W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 2.0 0.016 | | | W W/ $^\circ\text{C}$ |
| Unclamped Inductive Load Energy - Figure 13 | E | 25 | | | mJ |
| Operating and Storage Junction | T_J, T_{stg} | -65 to +150 | | | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristics | Symbol | Max | Unit |
|---|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 2.5 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5 | $^\circ\text{C/W}$ |

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.

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|---------------------|-----------------|
| TIP110 | TO-220 | 50 Units / Rail |
| TIP110G | TO-220 (Pb-Free) | 50 Units / Rail |
| TIP111 | TO-220 | 50 Units / Rail |
| TIP111G | TO-220 (Pb-Free) | 50 Units / Rail |
| TIP112 | TO-220 | 50 Units / Rail |
| TIP112G | TO-220 (Pb-Free) | 50 Units / Rail |
| TIP115 | TO-220 | 50 Units / Rail |
| TIP115G | TO-220 (Pb-Free) | 50 Units / Rail |
| TIP116 | TO-220 | 50 Units / Rail |
| TIP116G | TO-220 (Pb-Free) | 50 Units / Rail |
| TIP117 | TO-220 | 50 Units / Rail |
| TIP117G | TO-220 (Pb-Free) | 50 Units / Rail |

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---------------|-----------------|-------------------|------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Sustaining Voltage (Note 1) ($I_C = 30\text{ mA}$, $I_B = 0$) | $V_{CE(sus)}$ | 60 80 100 | - - - | Vdc |
| Collector Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 40\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 50\text{ Vdc}$, $I_B = 0$) | I_{CEO} | - - - | 2.0 2.0 2.0 | mAdc |
| Collector Cutoff Current ($V_{CB} = 60\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 80\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 100\text{ Vdc}$, $I_E = 0$) | I_{CBO} | - - - | 1.0 1.0 1.0 | mAdc |
| Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$) | I_{EBO} | - | 2.0 | mAdc |
| ON CHARACTERISTICS (Note 1) | | | | |
| DC Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) | h_{FE} | 1000 500 | - - | - |
| Collector-Emitter Saturation Voltage ($I_C = 2.0\text{ Adc}$, $I_B = 8.0\text{ mA}$) | $V_{CE(sat)}$ | - | 2.5 | Vdc |
| Base-Emitter On Voltage ($I_C = 2.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) | $V_{BE(on)}$ | - | 2.8 | Vdc |
| DYNAMIC CHARACTERISTICS | | | | |
| Small-Signal Current Gain ($I_C = 0.75\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ MHz}$) | h_{fe} | 25 | - | - |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$) | C_{ob} | - - | 200 100 | pF |

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

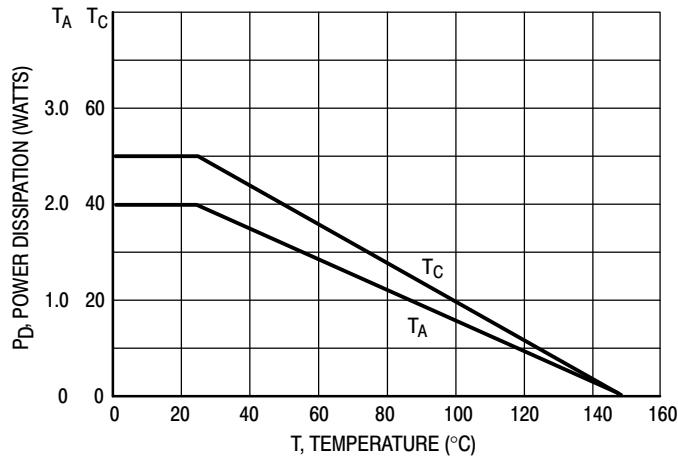
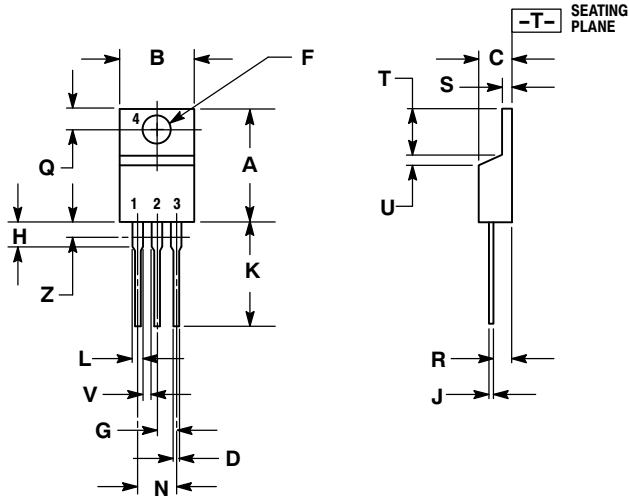


Figure 1. Power Derating

TIP110, TIP111, TIP112 (NPN); TIP115, TIP116, TIP117 (PNP)

PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AE



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 | 0.035 | 0.64 | 0.88 |
| F | 0.142 | 0.161 | 3.61 | 4.09 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.155 | 2.80 | 3.93 |
| 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 |