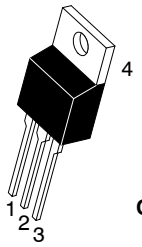
# Complementary Silicon Plastic Power Transistors

# TIP29, A, B, C (NPN), TIP30, A, B, C (PNP)

Designed for use in general purpose amplifier and switching applications. Compact TO−220 package.

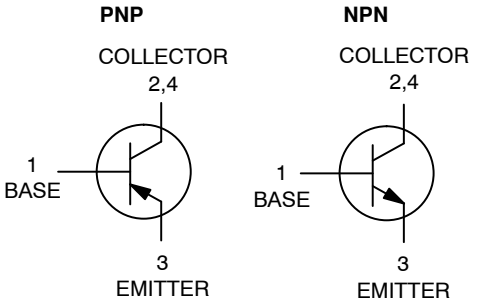



**TO−220**
**CASE 221A**
**STYLE 1**

### Features

- These Devices are Pb−Free and are RoHS Compliant*

**1 AMPERE**
**POWER TRANSISTORS**
**COMPLEMENTARY SILICON**
**40, 60, 80, 100 VOLTS,**
**80 WATTS**




### MAXIMUM RATINGS

| Symbol | Rating | Value | Unit |
|---|---|---|---|
| $V_{CEO}$ | Collector − Emitter Voltage<br>TIP29G, TIP30G<br>TIP29AG, TIP30AG<br>TIP29BG, TIP30BG<br>TIP29CG, TIP30CG | <br>40<br>60<br>80<br>100 | Vdc |
| $V_{CB}$ | Collector − Base Voltage<br>TIP29G, TIP30G<br>TIP29AG, TIP30AG<br>TIP29BG, TIP30BG<br>TIP29CG, TIP30CG | <br>40<br>60<br>80<br>100 | Vdc |
| $V_{EB}$ | Emitter − Base Voltage | 5.0 | Vdc |
| $I_C$ | Collector Current − Continuous | 1.0 | Adc |
| $I_{CM}$ | Collector Current − Peak | 3.0 | Adc |
| $I_B$ | Base Current | 0.4 | Adc |
| $P_D$ | Total Power Dissipation<br>@ $T_C$ = 25°C<br>Derate above 25°C | <br>30<br>0.24 | <br>W<br>W/°C |
| $P_D$ | Total Power Dissipation<br>@ $T_A$ = 25°C<br>Derate above 25°C | <br>2.0<br>0.016 | <br>W<br>W/°C |
| E | Unclamped Inductive Load Energy (Note 1) | 32 | mJ |
| $T_J$, $T_{stg}$ | Operating and Storage Junction Temperature Range | −65 to +150 | °C |

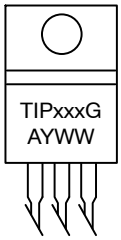
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. This rating based on testing with $L_C$ = 20 mH, $R_{BE}$ = 100 Ω, $V_{CC}$ = 10 V, $I_C$ = 1.8 A, P.R.F = 10 Hz

### THERMAL CHARACTERISTICS

| Symbol | Characteristic | Max | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction−to−Ambient | 62.5 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction−to−Case | 4.167 | °C/W |

### MARKING DIAGRAM




| | | |
|---|---|---|
| TIPxxx | = | Device Code:<br>29, 29A, 29B, 29C<br>30, 30A, 30B, 30C |
| A | = | Assembly Location |
| Y | = | Year |
| WW | = | Work Week |
| G | = | Pb−Free Package |

### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

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

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

| Symbol | Characteristic | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| $V_{CEO(sus)}$ | Collector−Emitter Sustaining Voltage ($I_C$ = 30 mAdc, $I_B$ = 0) (Note 2) | | | Vdc |
| | TIP29G, TIP30G | 40 | – | |
| | TIP29AG, TIP30AG | 60 | – | |
| | TIP29BG, TIP30BG | 80 | – | |
| | TIP29CG, TIP30CG | 100 | – | |
| $I_{CEO}$ | Collector Cutoff Current | | | mAdc |
| | ($V_{CE}$ = 30 Vdc, $I_B$ = 0) | | | |
| | TIP29G, TIP29AG, TIP30G, TIP30AG | – | 0.3 | |
| | ($V_{CE}$ = 60 Vdc, $I_B$ = 0) | | | |
| | TIP29BG, TIP29CG, TIP30BG, TIP30CG | – | 0.3 | |
| $I_{CES}$ | Collector Cutoff Current | | | μAdc |
| | ($V_{CE}$ = 40 Vdc, $V_{EB}$ = 0) | | | |
| | TIP29G, TIP30G | – | 200 | |
| | ($V_{CE}$ = 60 Vdc, $V_{EB}$ = 0) | | | |
| | TIP29AG, TIP30AG | – | 200 | |
| | ($V_{CE}$ = 80 Vdc, $V_{EB}$ = 0) | | | |
| | TIP29BG, TIP30BG | – | 200 | |
| | ($V_{CE}$ = 100 Vdc, $V_{EB}$ = 0) | | | |
| | TIP29CG, TIP30CG | – | 200 | |
| $I_{EBO}$ | Emitter Cutoff Current | | | mAdc |
| | ($V_{BE}$ = 5.0 Vdc, $I_C$ = 0) | – | 1.0 | |
| **ON CHARACTERISTICS** (Note 2) | | | | |
| $h_{FE}$ | DC Current Gain | | | – |
| | ($I_C$ = 0.2 Adc, $V_{CE}$ = 4.0 Vdc) | 40 | – | |
| | ($I_C$ = 1.0 Adc, $V_{CE}$ = 4.0 Vdc) | 15 | 75 | |
| $V_{CE(sat)}$ | Collector−Emitter Saturation Voltage | | | Vdc |
| | ($I_C$ = 1.0 Adc, $I_B$ = 125 mAdc) | – | 0.7 | |
| $V_{BE(on)}$ | Base−Emitter On Voltage | | | Vdc |
| | ($I_C$ = 1.0 Adc, $V_{CE}$ = 4.0 Vdc) | – | 1.3 | |
| **DYNAMIC CHARACTERISTICS** | | | | |
| $f_T$ | Current−Gain − Bandwidth Product (Note 3) | | | MHz |
| | ($I_C$ = 200 mAdc, $V_{CE}$ = 10 Vdc, $f_{test}$ = 1.0 MHz) | 3.0 | – | |
| $h_{fe}$ | Small−Signal Current Gain | | | – |
| | ($I_C$ = 0.2 Adc, $V_{CE}$ = 10 Vdc, f = 1.0 kHz) | 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 ≤ 300 μs, Duty Cycle ≤ 2.0%
3. $f_T = |h_{fe}| \bullet f_{test}$

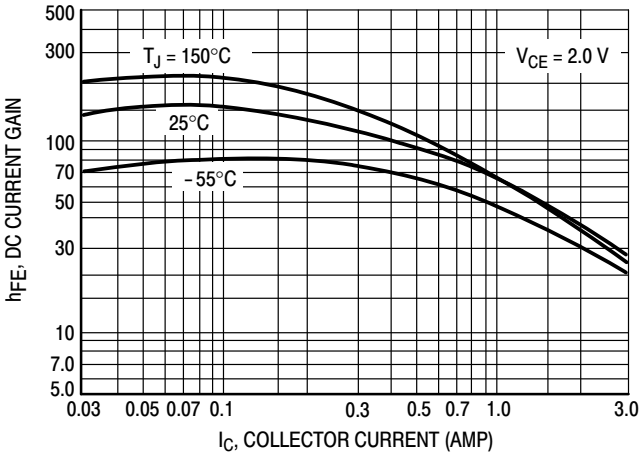



**Figure 1. DC Current Gain**

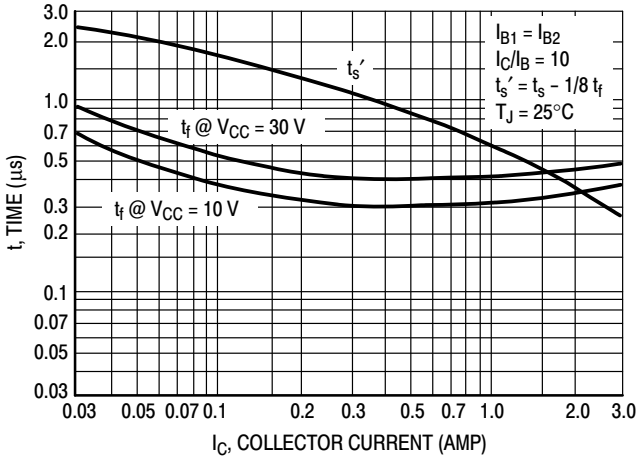



**Figure 2. Turn−Off Time**

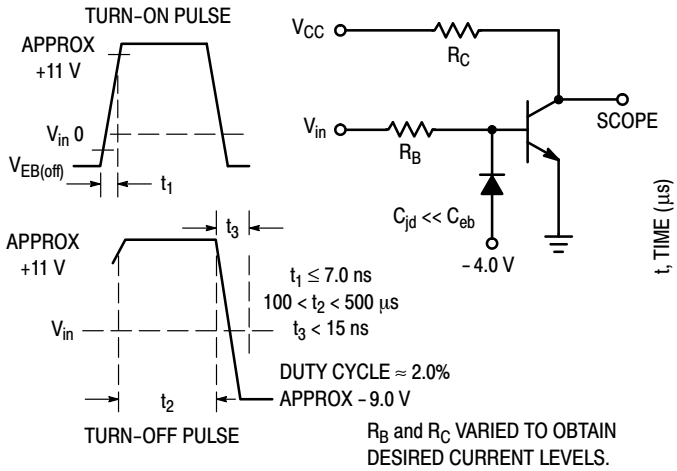



**Figure 3. Switching Time Equivalent Circuit**

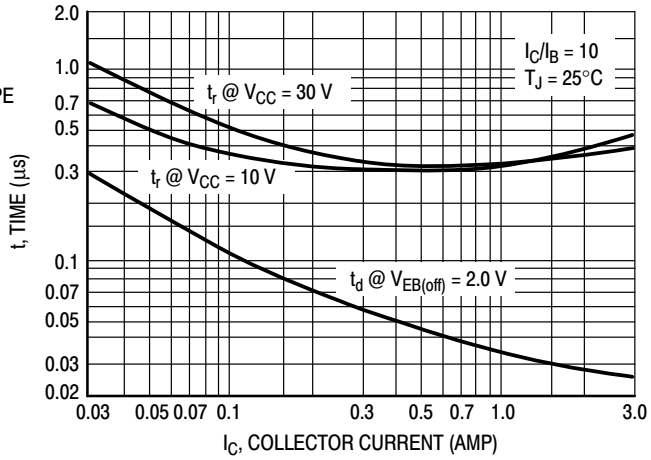



**Figure 4. Turn−On Time**

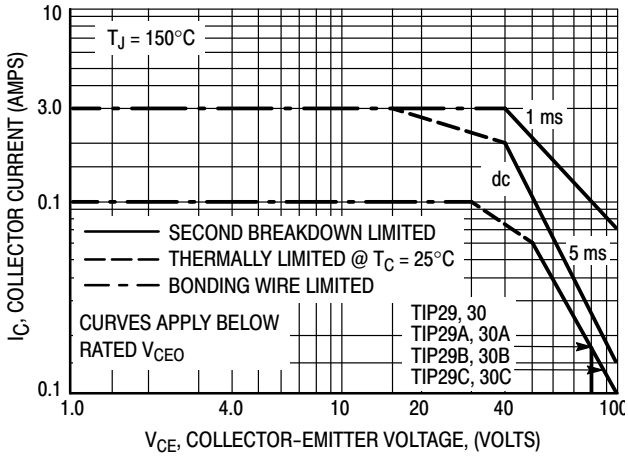


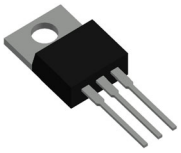

**Figure 5. Active Region Safe Operating Area**

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on $T_{J(pk)}$ = 150°C; $T_C$ is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

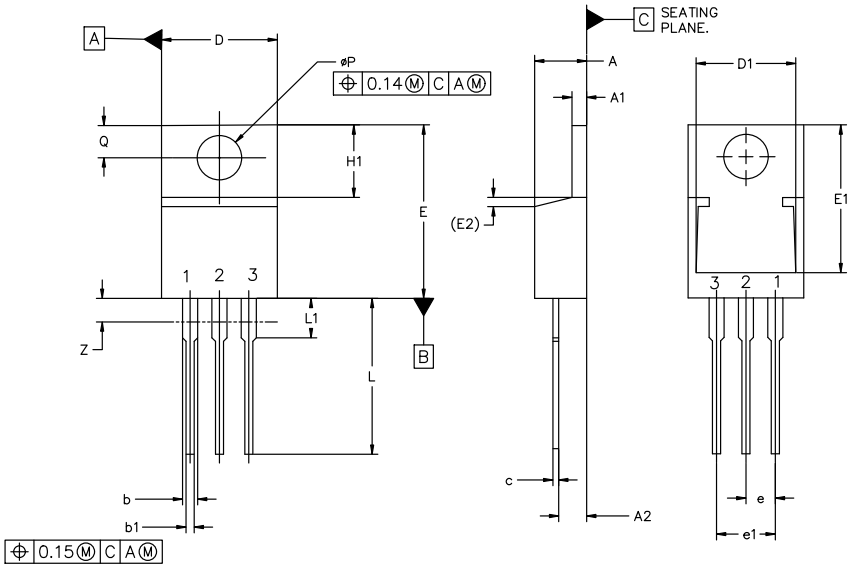
## ORDERING INFORMATION

| Device | Package | Shipping |
|---|---|---|
| TIP29G | TO−220 (Pb−Free) | 50 Units / Rail |
| TIP29AG | TO−220 (Pb−Free) | 50 Units / Rail |
| TIP29BG | TO−220 (Pb−Free) | 50 Units / Rail |
| TIP29CG | TO−220 (Pb−Free) | 50 Units / Rail |
| TIP30G | TO−220 (Pb−Free) | 50 Units / Rail |
| TIP30AG | TO−220 (Pb−Free) | 50 Units / Rail |
| TIP30BG | TO−220 (Pb−Free) | 50 Units / Rail |
| TIP30CG | TO−220 (Pb−Free) | 50 Units / Rail |



**TO−220−3 10.10x15.12x4.45, 2.54P**
CASE 221A
ISSUE AL

DATE 05 FEB 2025




| MILLIMETERS | | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| A | 4.07 | 4.45 | 4.83 |
| A1 | 1.15 | 1.28 | 1.41 |
| A2 | 2.04 | 2.42 | 2.79 |
| b | 1.15 | 1.34 | 1.52 |
| b1 | 0.64 | 0.80 | 0.96 |
| c | 0.36 | 0.49 | 0.61 |
| D | 9.66 | 10.10 | 10.53 |
| D1 | 8.43 | 8.63 | 8.83 |
| E | 14.48 | 15.12 | 15.75 |
| E1 | 12.58 | 12.78 | 12.98 |
| E2 | 1.27 REF | | |

| MILLIMETERS | | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| e | 2.42 | 2.54 | 2.66 |
| e1 | 4.83 | 5.08 | 5.33 |
| H1 | 5.97 | 6.22 | 6.47 |
| L | 12.70 | 13.49 | 14.27 |
| L1 | 2.80 | 3.45 | 4.10 |
| Q | 2.54 | 2.79 | 3.04 |
| øP | 3.60 | 3.85 | 4.09 |
| Z | −.−− | −.−− | 3.48 |

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

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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