

# 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.

### Features

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

### MAXIMUM RATINGS

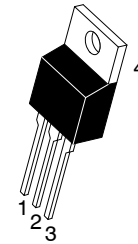
| Symbol         | Rating                                                                                                    | Value                 | Unit                     |
|----------------|-----------------------------------------------------------------------------------------------------------|-----------------------|--------------------------|
| $V_{CEO}$      | Collector – Emitter Voltage<br>TIP29G, TIP30G<br>TIP29AG, TIP30AG<br>TIP29BG, TIP30BG<br>TIP29CG, TIP30CG | 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    | 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>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$                  | 30<br>0.24            | W<br>W/ $^\circ\text{C}$ |
| $P_D$          | Total Power Dissipation<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$                  | 2.0<br>0.016          | W<br>W/ $^\circ\text{C}$ |
| E              | Unclamped Inductive Load Energy<br>(Note 1)                                                               | 32                    | mJ                       |
| $T_J, T_{stg}$ | Operating and Storage Junction<br>Temperature Range                                                       | -65 to +150           | $^\circ\text{C}$         |

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  $L_C = 20\text{ mH}$ ,  $R_{BE} = 100\ \Omega$ ,  $V_{CC} = 10\text{ V}$ ,  $I_C = 1.8\text{ A}$ , P.R.F = 10 Hz

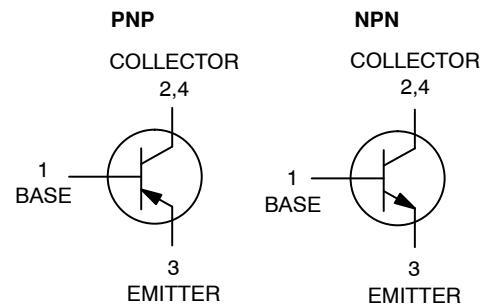
### THERMAL CHARACTERISTICS

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

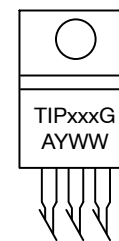


TO-220  
CASE 221A  
STYLE 1

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



### MARKING DIAGRAM



- TIPxxx = Device Code:  
29, 29A, 29B, 29C  
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](#).

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

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

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

### OFF CHARACTERISTICS

|               |                                                                                                                                                                                                                                                                                                     |                       |                          |                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------|-----------------|
| $V_{CE(sus)}$ | Collector–Emitter Sustaining Voltage<br>( $I_C = 30\text{ mAdc}$ , $I_B = 0$ ) (Note 2)<br>TIP29G, TIP30G<br>TIP29AG, TIP30AG<br>TIP29BG, TIP30BG<br>TIP29CG, TIP30CG                                                                                                                               | 40<br>60<br>80<br>100 | –<br>–<br>–<br>–         | Vdc             |
| $I_{CEO}$     | Collector Cutoff Current<br>( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ )<br>TIP29G, TIP29AG, TIP30G, TIP30AG<br>( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )<br>TIP29BG, TIP29CG, TIP30BG, TIP30CG                                                                                                          | –<br>–                | 0.3<br>0.3               | mAdc            |
| $I_{CES}$     | Collector Cutoff Current<br>( $V_{CE} = 40\text{ Vdc}$ , $V_{EB} = 0$ )<br>TIP29G, TIP30G<br>( $V_{CE} = 60\text{ Vdc}$ , $V_{EB} = 0$ )<br>TIP29AG, TIP30AG<br>( $V_{CE} = 80\text{ Vdc}$ , $V_{EB} = 0$ )<br>TIP29BG, TIP30BG<br>( $V_{CE} = 100\text{ Vdc}$ , $V_{EB} = 0$ )<br>TIP29CG, TIP30CG | –<br>–<br>–<br>–      | 200<br>200<br>200<br>200 | $\mu\text{Adc}$ |
| $I_{EBO}$     | Emitter Cutoff Current<br>( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                                                                                                                                                 | –                     | 1.0                      | mAdc            |

### ON CHARACTERISTICS (Note 2)

|               |                                                                                                                                     |          |         |     |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------|----------|---------|-----|
| $h_{FE}$      | DC Current Gain<br>( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) | 40<br>15 | –<br>75 | –   |
| $V_{CE(sat)}$ | Collector–Emitter Saturation Voltage<br>( $I_C = 1.0\text{ Adc}$ , $I_B = 125\text{ mAdc}$ )                                        | –        | 0.7     | Vdc |
| $V_{BE(on)}$  | Base–Emitter On Voltage<br>( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )                                                   | –        | 1.3     | Vdc |

### DYNAMIC CHARACTERISTICS

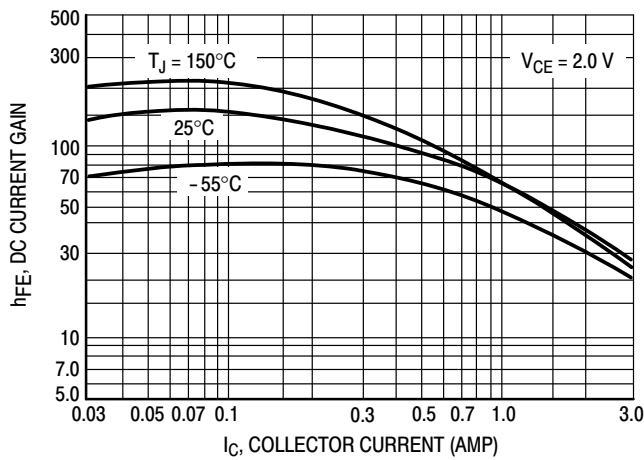
|          |                                                                                                                                   |     |   |     |
|----------|-----------------------------------------------------------------------------------------------------------------------------------|-----|---|-----|
| $f_T$    | Current–Gain – Bandwidth Product (Note 3)<br>( $I_C = 200\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 1.0\text{ MHz}$ ) | 3.0 | – | MHz |
| $h_{fe}$ | Small–Signal Current Gain<br>( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                         | 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.

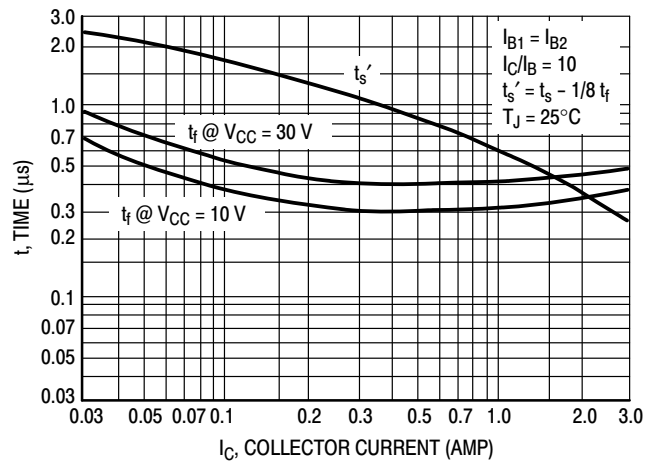
2. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

3.  $f_T = |h_{fe}| \cdot f_{test}$

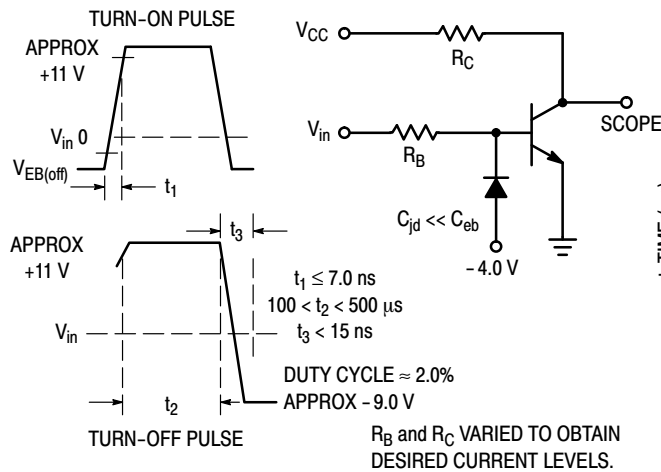
## TIP29, A, B, C (NPN), TIP30, A, B, C (PNP)



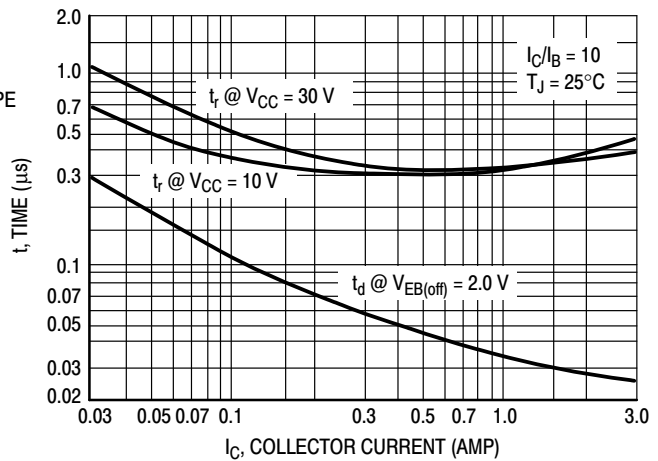
**Figure 1. DC Current Gain**



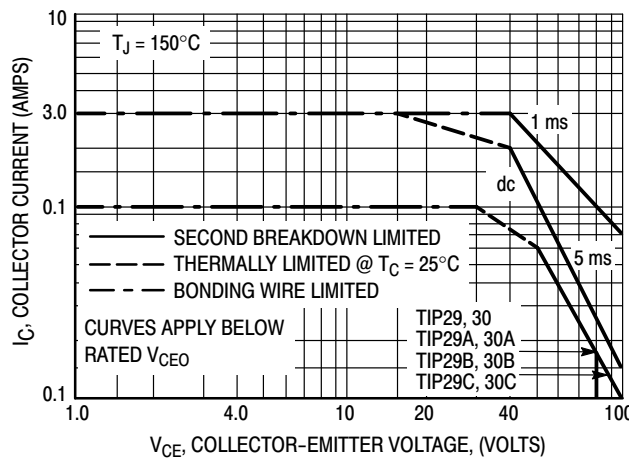
**Figure 2. Turn-Off Time**



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

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

### ORDERING INFORMATION

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