

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

## Complementary Silicon Plastic Power Transistors

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

Rating	Symbol	Value	Unit
Collector – Emitter Voltage TIP29G, TIP30G TIP29AG, TIP30AG TIP29BG, TIP30BG TIP29CG, TIP30CG	$V_{CEO}$	40 60 80 100	Vdc
Collector – Base Voltage TIP29G, TIP30G TIP29AG, TIP30AG TIP29BG, TIP30BG TIP29CG, TIP30CG	$V_{CB}$	40 60 80 100	Vdc
Emitter – Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current – Continuous	$I_C$	1.0	Adc
Collector Current – Peak	$I_{CM}$	3.0	Adc
Base Current	$I_B$	0.4	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	30 0.24	W W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.0 0.016	W W/ $^\circ\text{C}$
Unclamped Inductive Load Energy (Note 1)	E	32	mJ
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-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  $L_C = 20$  mH,  $R_{BE} = 100$   $\Omega$ ,  $V_{CC} = 10$  V,  $I_C = 1.8$  A, P.R.F = 10 Hz

### THERMAL CHARACTERISTICS

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

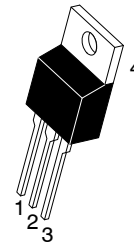
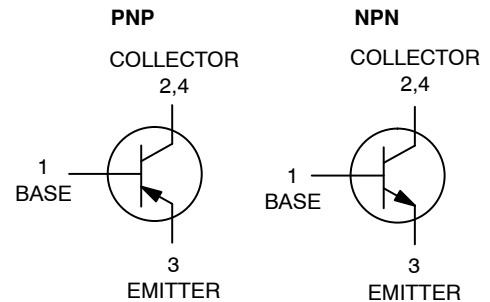
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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



TO-220  
CASE 221A  
STYLE 1

### 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.

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

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

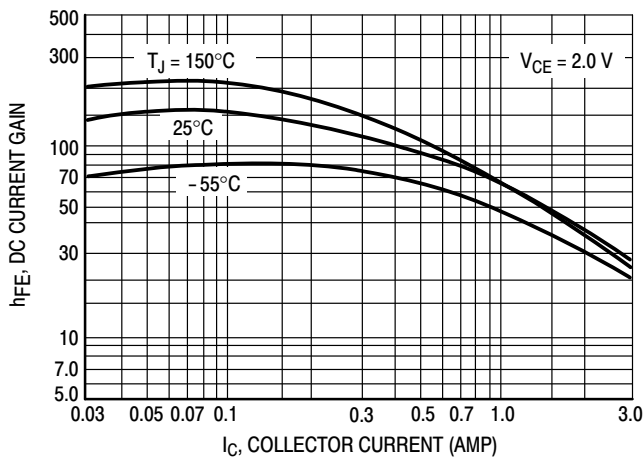
Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Sustaining Voltage ( $I_C = 30\text{ mAdc}$ , $I_B = 0$ ) (Note 2) TIP29G, TIP30G TIP29AG, TIP30AG TIP29BG, TIP30BG TIP29CG, TIP30CG	$V_{CEO(sus)}$	40 60 80 100	- - - -	Vdc
Collector Cutoff Current ( $V_{CE} = 30\text{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

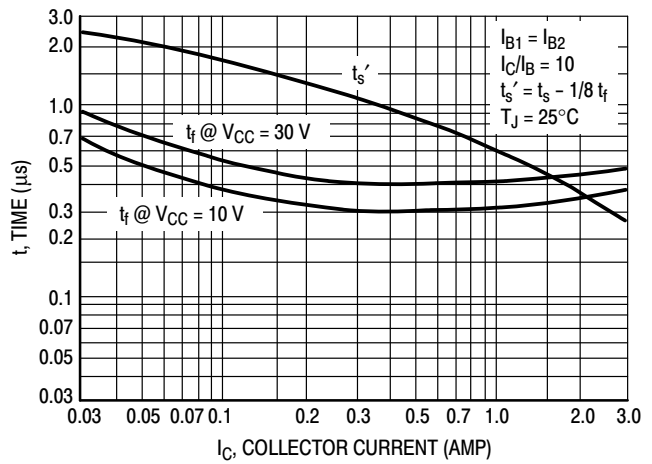
2. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

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

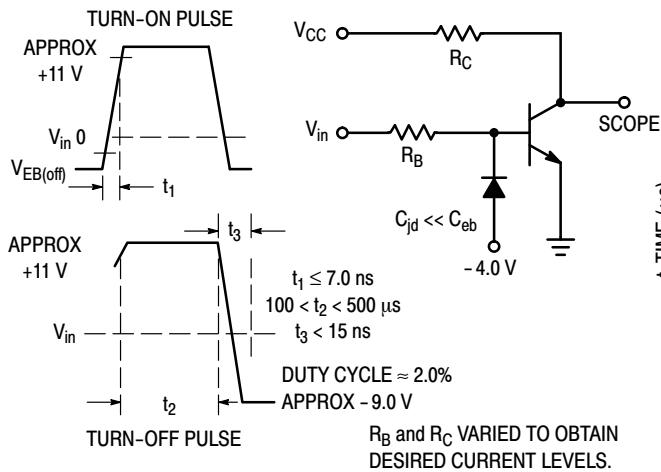
## TIP29, A, B, C (NPN), TIP30, A, B, C (PNP)



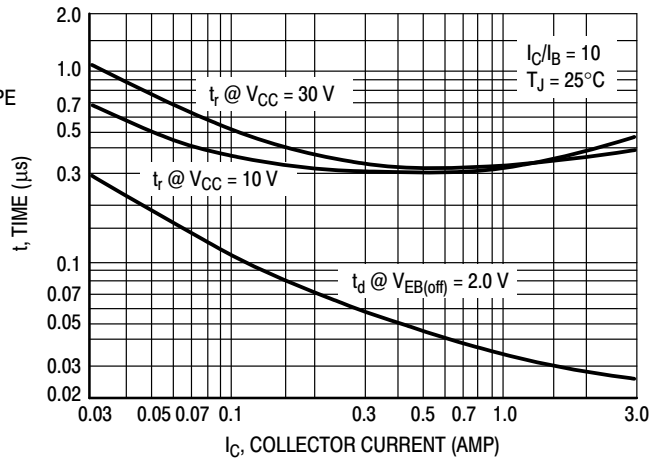
**Figure 1. DC Current Gain**



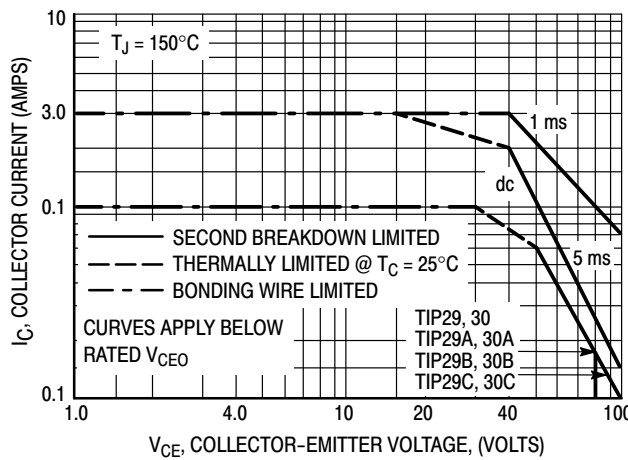
**Figure 2. Turn-Off Time**



**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 (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

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