

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



**ON Semiconductor®**

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## Complementary Silicon Plastic Power Transistors

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

### Features

- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

Rating	Symbol	29 30	29A 30A	29B 30B	29C 30C	Unit
Collector – Emitter Voltage	$V_{CE0}$	40	60	80	100	Vdc
Collector – Base Voltage	$V_{CB}$	40	60	80	100	Vdc
Emitter – Base Voltage	$V_{EB}$	5.0				Vdc
Collector Current – Continuous – Peak	$I_C$	1.0 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				$^\circ\text{C}$

### THERMAL CHARACTERISTICS

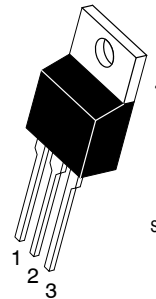
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	4.167	$^\circ\text{C}/\text{W}$

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.

- 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

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

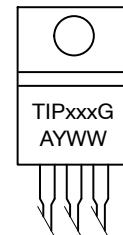
## 1 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON 40, 60, 80, 100 VOLTS, 80 WATTS



TO-220AB  
CASE 221A  
STYLE 1

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

### MARKING DIAGRAM



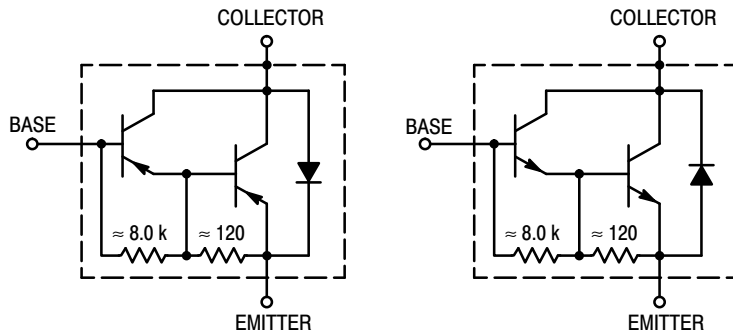
TIPxxx = Device Code:  
29, 29A, 29B, 29C  
30, 30A, 30B, 30C

A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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



**Figure 1. Darlington Circuit Schematic**

### ORDERING INFORMATION

Device	Package	Shipping
TIP29	TO-220	50 Units / Rail
TIP29G	TO-220 (Pb-Free)	50 Units / Rail
TIP29A	TO-220	50 Units / Rail
TIP29AG	TO-220 (Pb-Free)	50 Units / Rail
TIP29B	TO-220	50 Units / Rail
TIP29BG	TO-220 (Pb-Free)	50 Units / Rail
TIP29C	TO-220	50 Units / Rail
TIP29CG	TO-220 (Pb-Free)	50 Units / Rail
TIP30	TO-220	50 Units / Rail
TIP30G	TO-220 (Pb-Free)	50 Units / Rail
TIP30A	TO-220	50 Units / Rail
TIP30AG	TO-220 (Pb-Free)	50 Units / Rail
TIP30B	TO-220	50 Units / Rail
TIP30BG	TO-220 (Pb-Free)	50 Units / Rail
TIP30C	TO-220	50 Units / Rail
TIP30CG	TO-220 (Pb-Free)	50 Units / Rail

## 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
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#### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ( $I_C = 30\text{ mAdc}$ , $I_B = 0$ ) (Note 2)	$V_{CEO(sus)}$	40 60 80 100	- - - -	Vdc
TIP29, TIP30 TIP29A, TIP30A TIP29B, TIP30B TIP29C, TIP30C				
Collector Cutoff Current ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	- -	0.3 0.3	mAdc
TIP29, TIP29A, TIP30, TIP30A TIP29B, TIP29C, TIP30B, TIP30C				
Collector Cutoff Current ( $V_{CE} = 40\text{ Vdc}$ , $V_{EB} = 0$ ) ( $V_{CE} = 60\text{ Vdc}$ , $V_{EB} = 0$ ) ( $V_{CE} = 80\text{ Vdc}$ , $V_{EB} = 0$ ) ( $V_{CE} = 100\text{ Vdc}$ , $V_{EB} = 0$ )	$I_{CES}$	- - - -	200 200 200 200	$\mu\text{Adc}$
TIP29, TIP30 TIP29A, TIP30A TIP29B, TIP30B TIP29C, TIP30C				
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	-	1.0	mAdc

#### ON CHARACTERISTICS (Note 2)

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

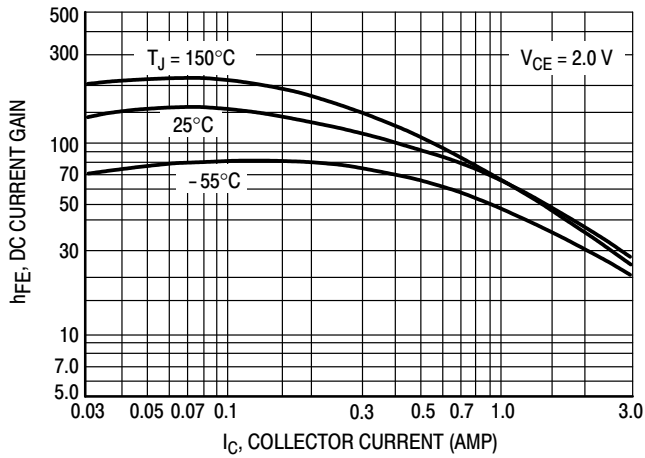
#### DYNAMIC CHARACTERISTICS

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	-	-

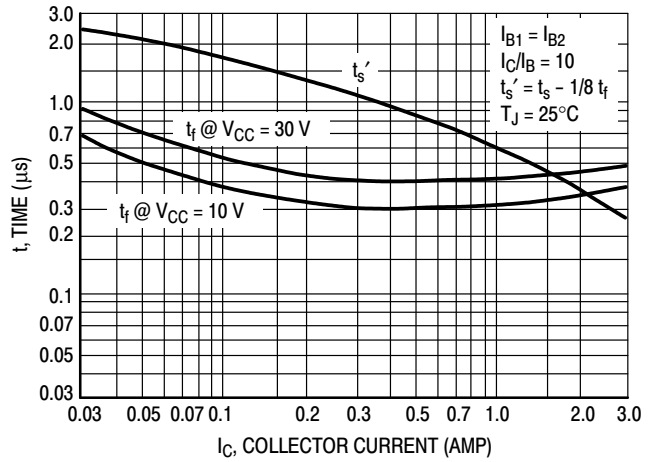
2. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

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

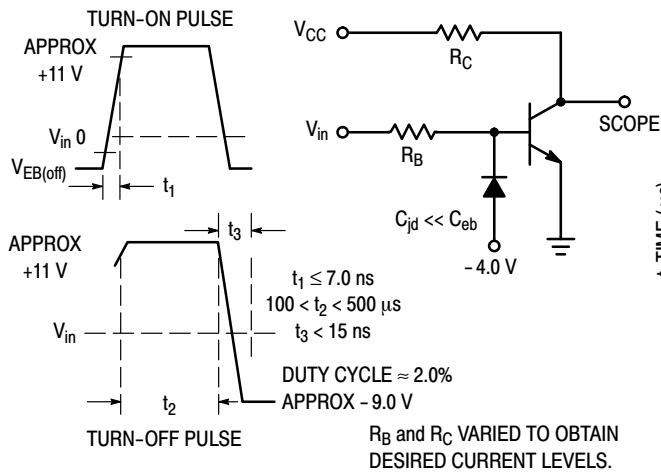
## TIP29, A, B, C (NPN), TIP30, A, B, C (PNP)



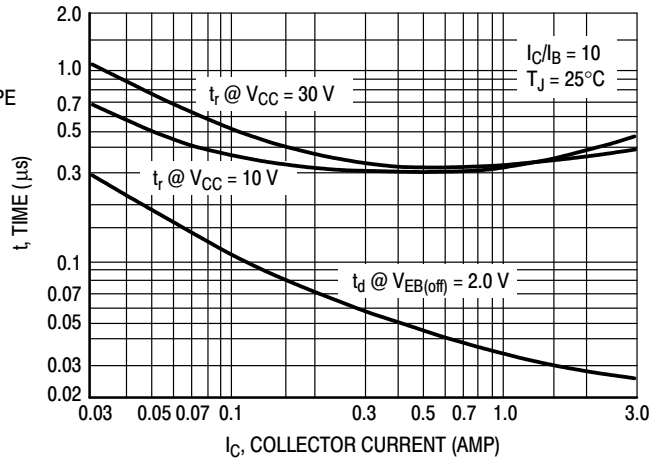
**Figure 2. DC Current Gain**



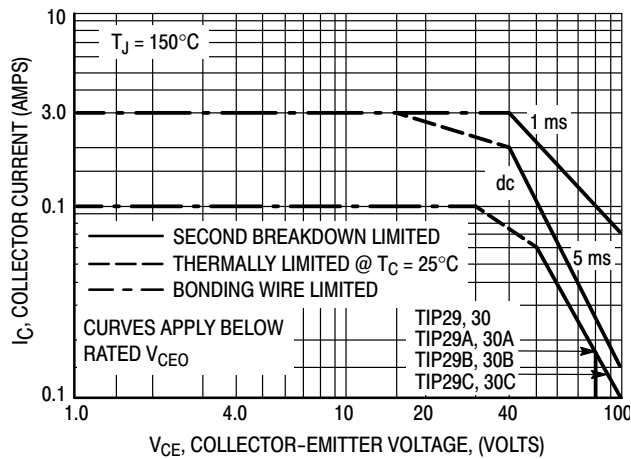
**Figure 3. Turn-Off Time**



**Figure 4. Switching Time Equivalent Circuit**



**Figure 5. Turn-On Time**



**Figure 6. Active Region Safe Operating Area**

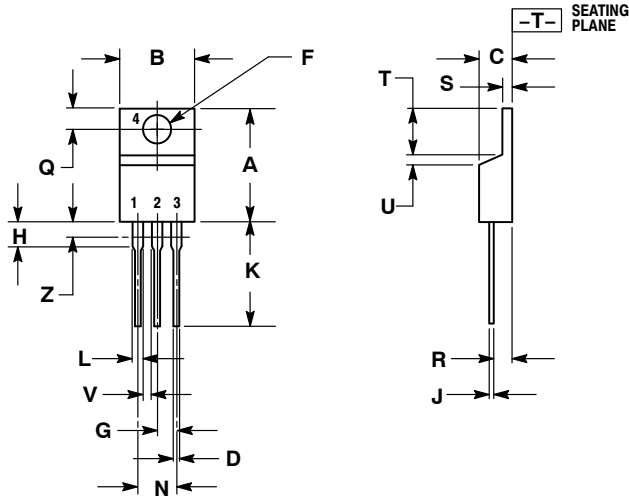
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 6 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.

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## PACKAGE DIMENSIONS

TO-220  
CASE 221A-09  
ISSUE AG



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	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
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

STYLE 1:

1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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