

# High Power Bipolar Transistors

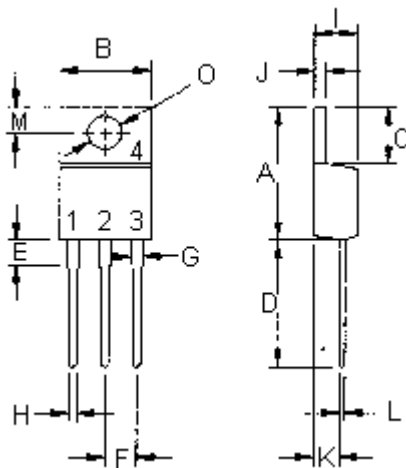


## Tip Series



### Features:

- Collector-Emitter sustaining voltage-  
 $V_{CE(sus)}$  = 60 V (Minimum) - TIP29A, TIP30A  
 = 100 V (Minimum) - TIP29C, TIP30C
- Collector-Emitter saturation voltage-  
 $V_{CE(sat)}$  = 0.7 V (Maximum) at  $I_C = 1$  A
- Current gain-bandwidth product  $f_T = 3$  MHz (Minimum) at  $I_C = 200$  mA



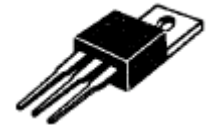
- Pin 1. Base  
 2. Collector  
 3. Emitter  
 4. Collector (Case)

Dimensions	Minimum	Maximum
A	14.68	15.31
B	9.78	10.42
C	5.01	6.52
D	13.06	14.62
E	3.57	4.07
F	2.42	3.66
G	1.12	1.36
H	0.72	0.96
I	4.22	4.98
J	1.14	1.38
K	2.2	2.97
L	0.33	0.55
M	2.48	2.98
O	3.7	3.9

Dimensions : Millimetres

**NPN**    **PNP**  
**TIP29A** **TIP30A**  
**TIP29C** **TIP30C**

1 A  
 Complementary Silicon  
 Power Transistors  
 40 - 100 V  
 30 W



TO-220

### Maximum Ratings

Characteristic	Symbol	TIP29A TIP30A	TIP29C TIP30C	Unit
Collector-Emitter Voltage	$V_{CEO}$	60	100	V
Collector-Base Voltage	$V_{CBO}$			
Emitter-Base Voltage	$V_{EBO}$	5		
Collector Current-Continuous - Peak	$I_C$	1 3		A
Base Current	$I_B$	0.4		
Total Power Dissipation at $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	30 0.24		W W / °C
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	-65 to +150		°C

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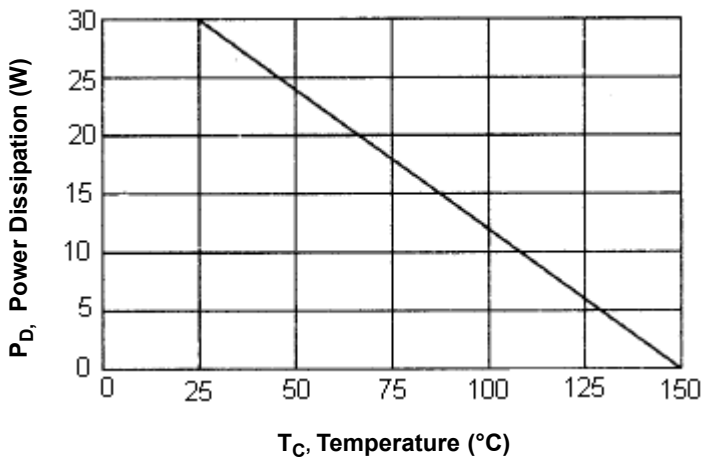


## Tip Series

### Thermal Characteristics

Characteristic	Symbol	Maximum	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	4.167	$^{\circ}\text{C} / \text{W}$

Figure - 1 Power Derating



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

Characteristic	Symbol	Minimum	Maximum	Unit
<b>OFF Characteristics</b>				
Collector-Emitter Sustaining Voltage (1) ( $I_C = 30 \text{ mA}$ , $I_B = 0$ ) TIP29A, TIP30A TIP29C, TIP30C	$V_{CEO(sus)}$	60 100	-	V
Collector Cut off Current ( $V_{CE} = 30 \text{ V}$ , $I_B = 0$ ) ( $V_{CE} = 60 \text{ V}$ , $I_B = 0$ ) TIP29A, TIP30A TIP29C, TIP30C	$I_{CEO}$	-	0.3	mA
Collector Cut off Current ( $V_{CE} = 60 \text{ V}$ , $V_{EB} = 0$ ) ( $V_{CE} = 100 \text{ V}$ , $V_{EB} = 0$ ) TIP29A, TIP30A TIP29C, TIP30C	$I_{CES}$	-	0.2	
Emitter Cut off Current ( $V_{EB} = 5 \text{ V}$ , $I_C = 0$ )	$I_{EBO}$	-	1	
<b>ON Characteristics (1)</b>				
DC Current Gain ( $I_C = 0.2 \text{ A}$ , $V_{CE} = 4 \text{ V}$ ) ( $I_C = 1 \text{ A}$ , $V_{CE} = 4 \text{ V}$ )	$h_{FE}$	40 15	- 75	-
Collector-Emitter Saturation Voltage ( $I_C = 1 \text{ A}$ , $I_B = 125 \text{ mA}$ )	$V_{CE(sat)}$	-	0.7	V
Base-Emitter On Voltage ( $I_C = 1 \text{ A}$ , $V_{CE} = 4 \text{ V}$ )	$V_{BE(on)}$	-	1.3	

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## Tip Series

Characteristic	Symbol	Minimum	Maximum	Unit
<b>Dynamic Characteristics</b>				
Current Gain-Bandwidth Product (2) ( $I_C = 200 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ , $f = 1 \text{ MHz}$ )	$f_T$	3	-	MHz
Small Signal Current Gain ( $I_C = 200 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ , $f = 1 \text{ kHz}$ )	$h_{fe}$	20	-	-

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

(2)  $f_T = |h_{FE}| \cdot f_{\text{Test}}$

Figure - 2 Turn-On Time

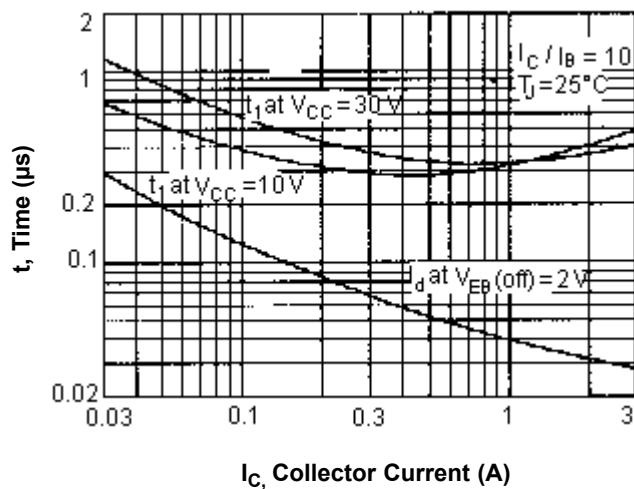
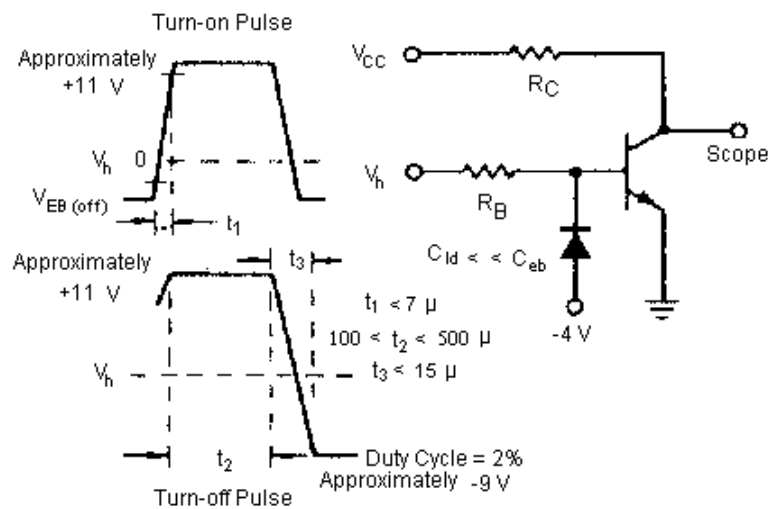


Figure - 3 Switching Time Equivalent Circuit



$R_B$  and  $R_C$  Varied to Obtain Desired Current Levels

Figure - 4 DC Current Gain

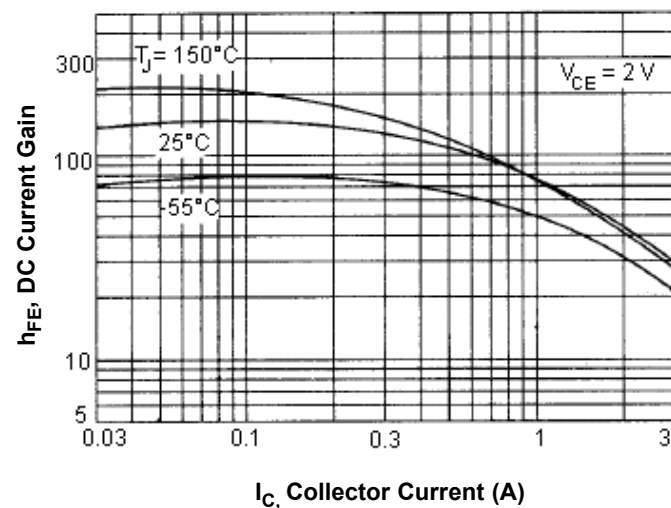
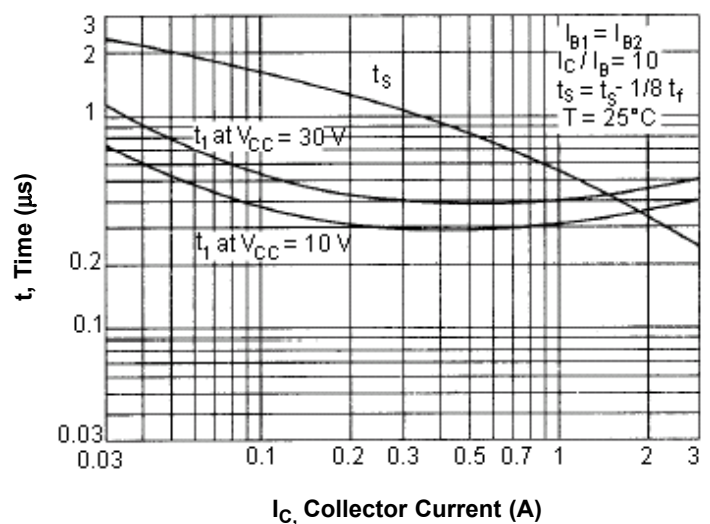


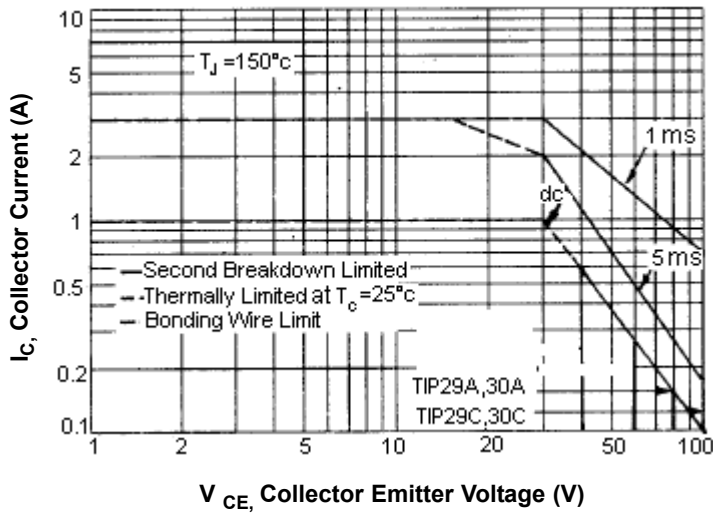
Figure - 5 Turn-Off Time



# High Power Bipolar Transistors

## Tip Series

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  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than the curves indicate

The data of figure - 6 curve is based on  $T_{J(PK)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(PK)} = 150^\circ\text{C}$ . At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown

### Specification Table

Type	Part Number
NPN	TIP29A
	TIP29C
PNP	TIP30A
	TIP30C

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