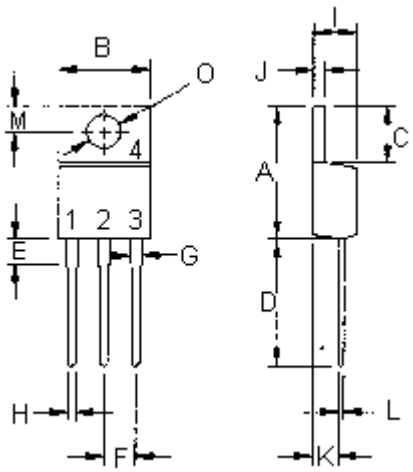
High Power Bipolar Transistors

Tip Series

Features:

- Collector-Emitter sustaining voltage-
  $V_{CEO\ (sus)}$ = 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

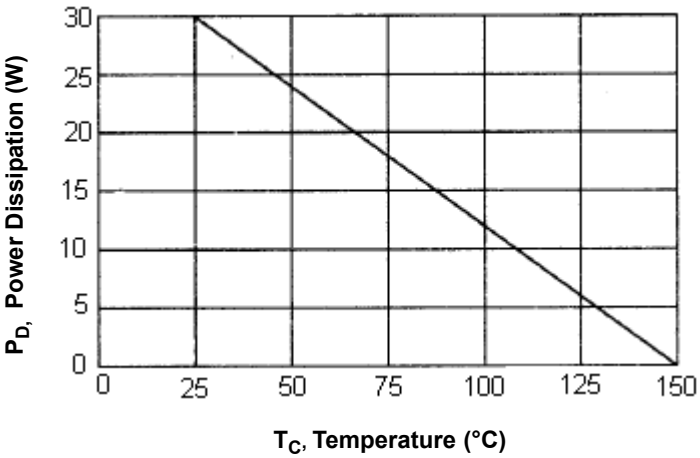
Maximum Ratings

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°C Derate above 25°C	P_D	30 0.24		W W / °C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150		°C

Thermal Characteristics

Characteristic	Symbol	Maximum	Unit
Thermal Resistance Junction to Case	Rθjc	4.167	°C / W

Figure - 1 Power Derating



Electrical Characteristics (T_C = 25°C unless otherwise noted)

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

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

(1) Pulse Test: Pulse Width ≤300 µs, Duty Cycle ≤2%
(2) $f_T = | h_{FE} | \bullet f_{Test}$

Figure - 2 Turn-On Time

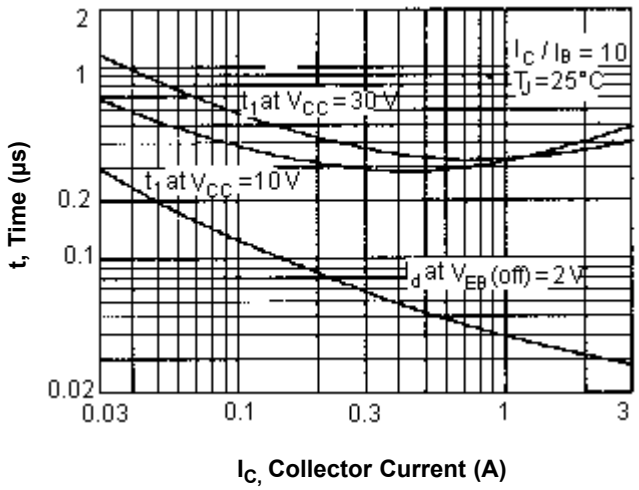
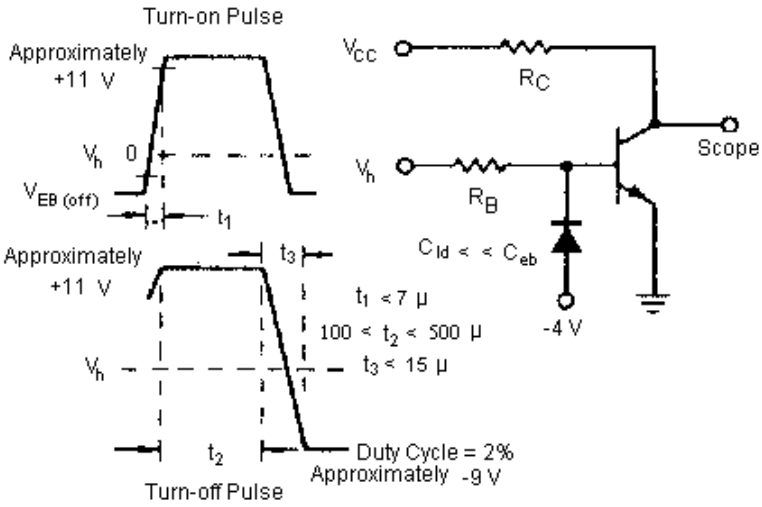


Figure - 3 Switching Time Equivalent Circuit



R_B and R_C Varied to Obtain Desired Current Levels

Figure - 4 DC Current Gain

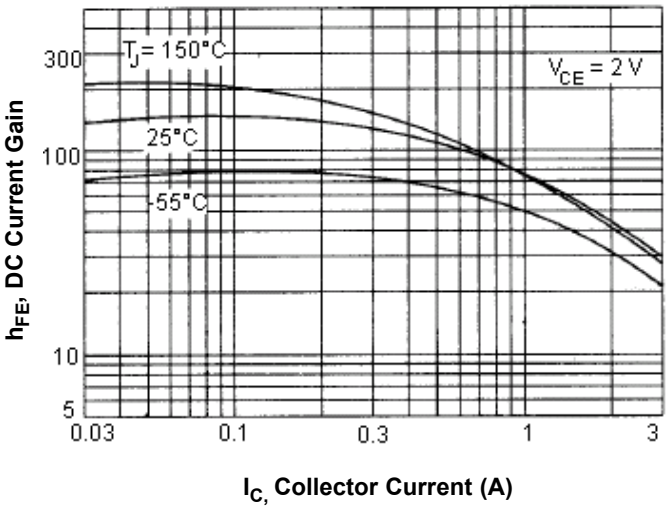


Figure - 5 Turn-Off Time

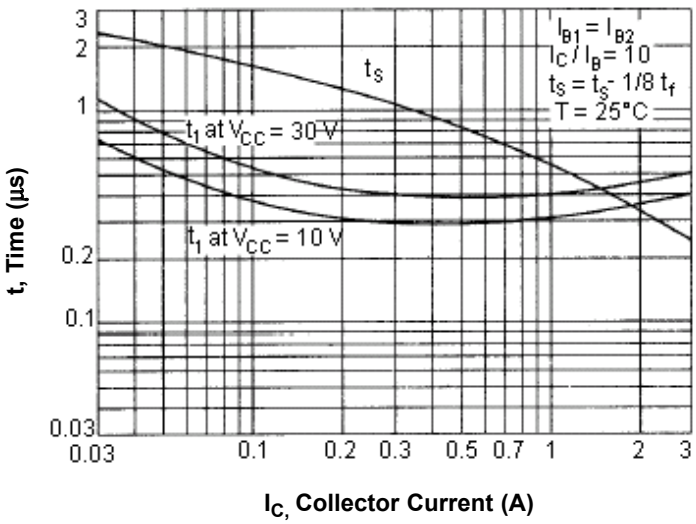
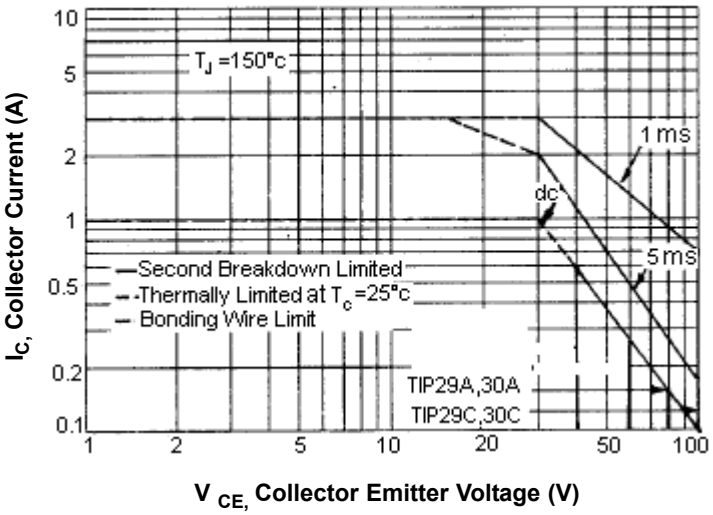


Figure - 6 Active Region Safe Operating Area



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°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°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