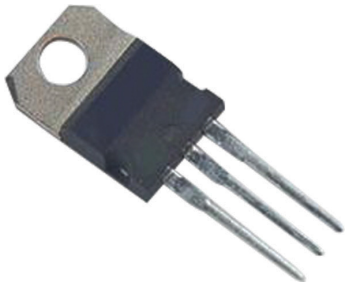
High Power Bipolar Transistor



Features:

- Collector-Emitter sustaining voltage -
  $V_{CEO(sus)}$ = 60V (Min.) - TIP31A, TIP32A
  = 100V (Min.) - TIP31C, TIP32C
- Collector-Emitter saturation voltage -
  $V_{CE(sat)}$ = 1.2V (Max.) at I_C = 3A
- Current gain-bandwidth product f_T = 3MHz (Min.) at I_C = 500mA

Maximum Ratings

Characteristic	Symbol	TIP31A TIP32A	TIP31C TIP32C	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	3 5		A
Base Current	I_B	1		
Total Power Dissipation at T_C = 25°C Derate above 25°C	P_D	40 0.32		W W/°C
Operation and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150		°C

Thermal Characteristics

Characteristic	Symbol	Max.	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	3.125	°C/W

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

Characteristic	Symbol	Min.	Max.	Unit
OFF Characteristics				
Collector-Emitter Sustaining Voltage (1) I_C = 30mA, I_B = 0 TIP31A, TIP32A TIP31C, TIP32C	$V_{CEO(sus)}$	60 100	-	V
Collector Cut off Current V_{CE} = 30V, I_B = 0 TIP31A, TIP32A V_{CE} = 60V, I_B = 0 TIP31C, TIP32C	I_{CEO}	-	0.3	mA
Collector Cut off Current V_{CE} = 60V, V_{EB} = 0 TIP31A, TIP32A V_{CE} = 100V, V_{EB} = 0 TIP31C, TIP32C	I_{CES}	-	0.2	
Emitter Cut off Current V_{EB} = 5V, I_C = 0	I_{EBO}	-	1	
ON Characteristics (1)				
DC Current Gain I_C = 1A, V_{CE} = 4V I_C = 3A, V_{CE} = 4V	h_{FE}	25 10	- 50	-
Collector-Emitter Saturation Voltage I_C = 3A, I_B = 375mA	$V_{CE(sat)}$	-	1.2	V
Base-Emitter On Voltage I_C = 3A, V_{CE} = 4V	$V_{BE(on)}$	-	1.8	
Dynamic Characteristics				
Current Gain-Bandwidth Product (2) I_C = 500mA, V_{CE} = 10V, f_{TEST} = 1MHz	f_T	3	-	MHz
Small Signal Current Gain I_C = 500mA, V_{CE} = 10V, f = 1kHz	h_{FE}	20	-	-

(1) Pulse Test: Pulse width ≤300μs, Duty Cycle ≤2%

(2) $f_T = h_{FE} \bullet f_{TEST}$

Figure - 1 Power Derating

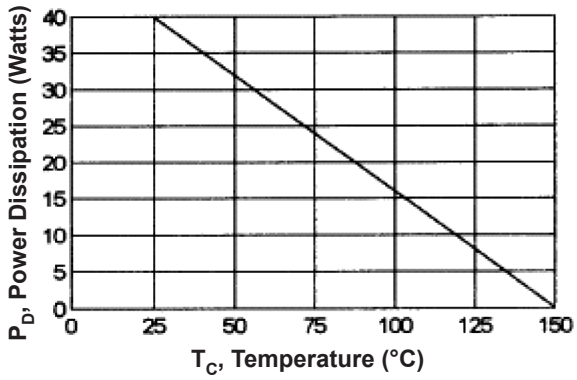
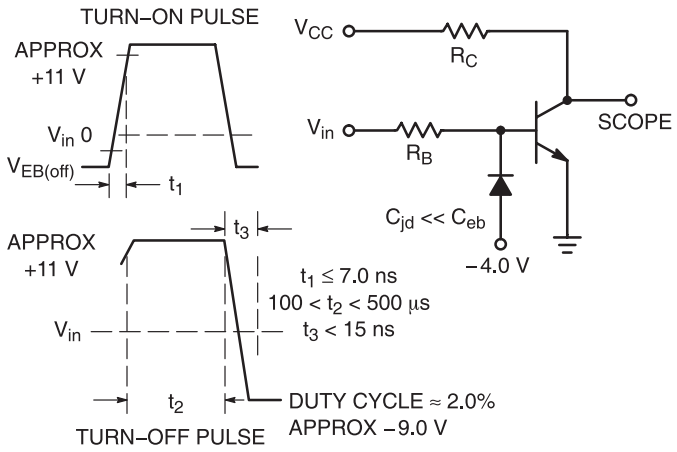


Figure - 2 Switching Time Equivalent Circuit



R_B and R_C Varied to Obtain Desired Current Levels

Figure - 3 Turn-On Time

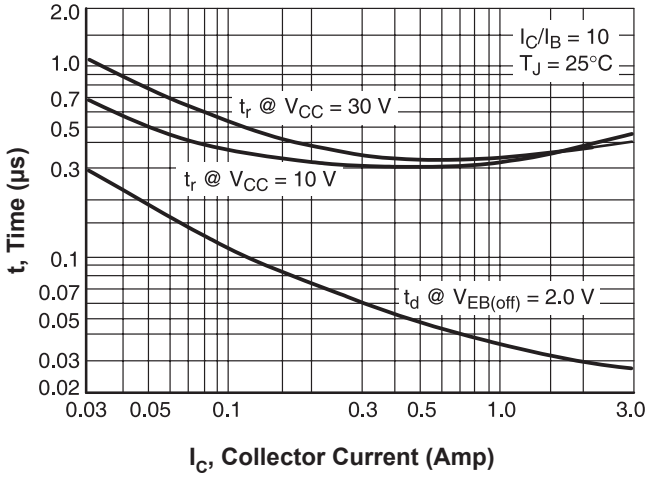


Figure - 4 DC Current Gain

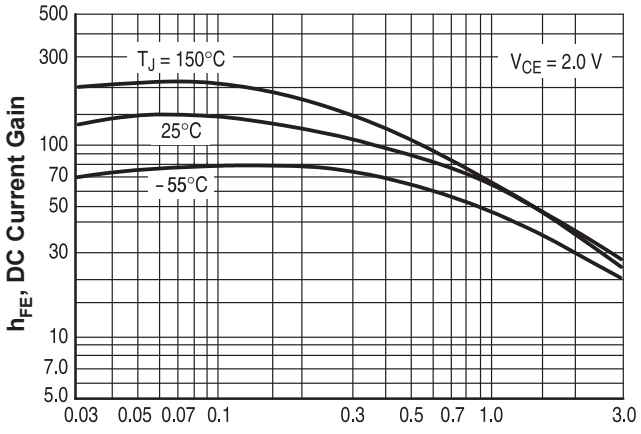


Figure - 5 Turn-Off Time

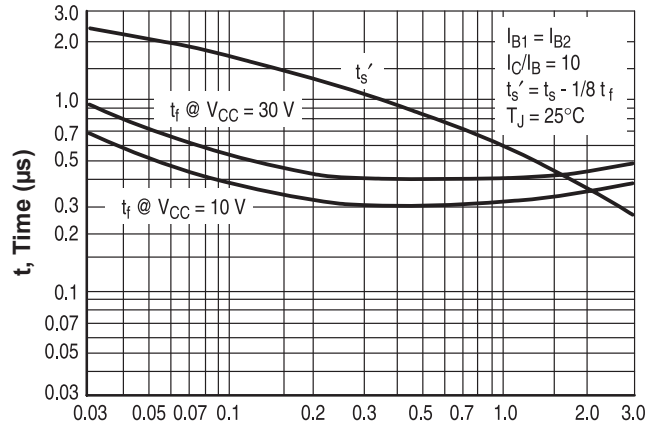
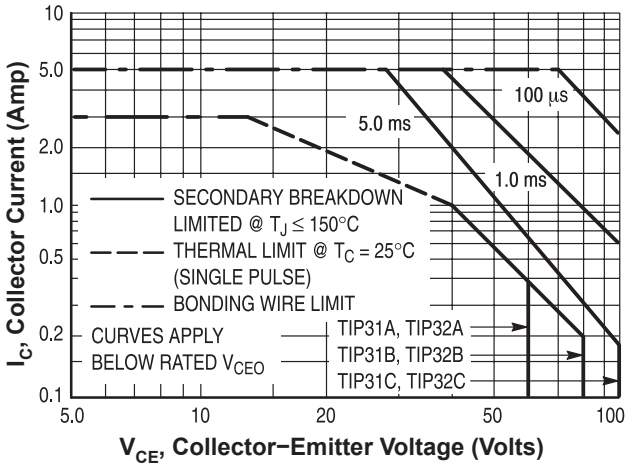


Figure - 6 Active Region Safe Operating Area



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 $T_{J(PK)} \leq 150°C$, At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

Figure - 7 Collector Saturation Region

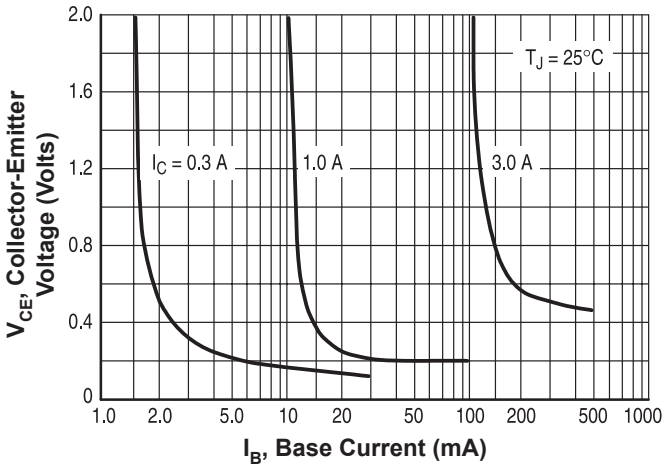


Figure - 8 Capacitances

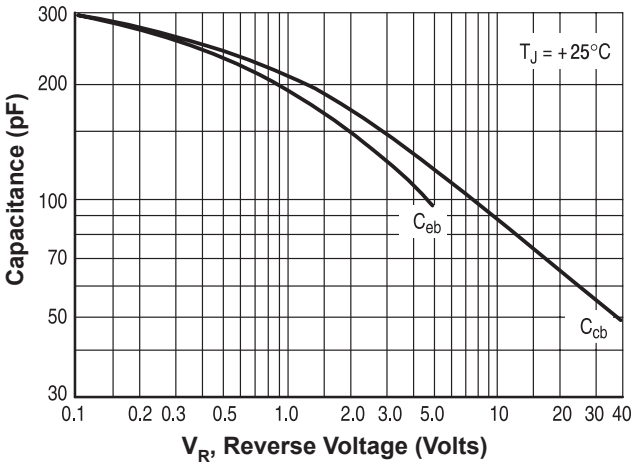


Figure - 9 "ON" Voltage

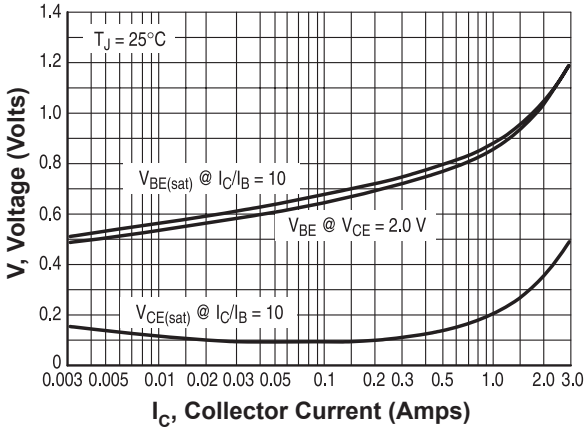
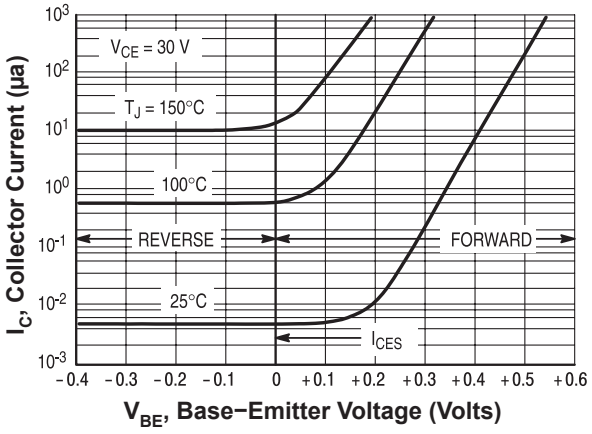
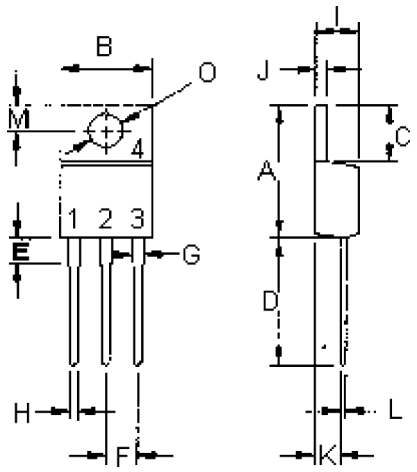


Figure - 10 Collector Cut-off Region





Pin Configuration:

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

Dimensions	Min.	Max.
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

Part Number Table

Description	Part Number
Transistor, NPN, TO-220	TIP31A
	TIP31C
Transistor, PNP, TO-220	TIP32A
	TIP32C