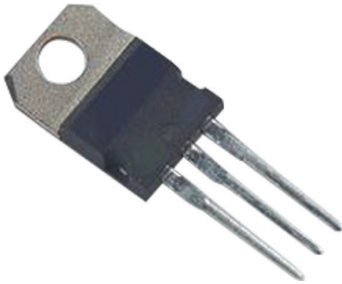


High Power Bipolar Transistor **multicomp**



Features:

- Collector-Emitter sustaining voltage -
 $V_{CE(sus)} = 60V$ (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	$^\circ C/W$

High Power Bipolar Transistor

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 (1) $I_C = 30\text{mA}$, $I_B = 0$ TIP31A, TIP32A TIP31C, TIP32C	$V_{CEO(sus)}$	60 100	-	V
Collector Cut off Current $V_{CE} = 30\text{V}$, $I_B = 0$ $V_{CE} = 60\text{V}$, $I_B = 0$ TIP31A, TIP32A TIP31C, TIP32C	I_{CEO}	-	0.3	mA
Collector Cut off Current $V_{CE} = 60\text{V}$, $V_{EB} = 0$ $V_{CE} = 100\text{V}$, $V_{EB} = 0$ TIP31A, TIP32A TIP31C, TIP32C	I_{CES}	-	0.2	
Emitter Cut off Current $V_{EB} = 5\text{V}$, $I_C = 0$	I_{EBO}	-	1	

ON Characteristics (1)

DC Current Gain $I_C = 1\text{A}$, $V_{CE} = 4\text{V}$ $I_C = 3\text{A}$, $V_{CE} = 4\text{V}$	h_{FE}	25 10	- 50	-
Collector-Emitter Saturation Voltage $I_C = 3\text{A}$, $I_B = 375\text{mA}$	$V_{CE(sat)}$	-	1.2	V
Base-Emitter On Voltage $I_C = 3\text{A}$, $V_{CE} = 4\text{V}$	$V_{BE(on)}$	-	1.8	

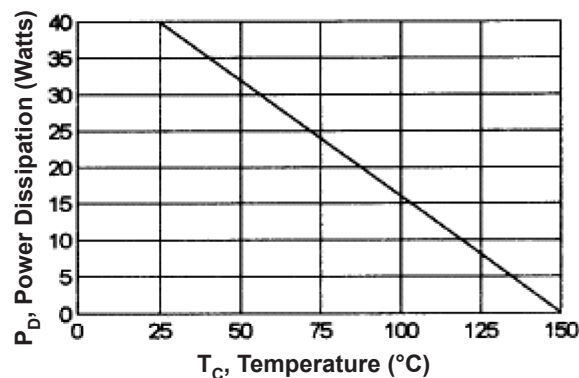
Dynamic Characteristics

Current Gain-Bandwidth Product (2) $I_C = 500\text{mA}$, $V_{CE} = 10\text{V}$, $f_{TEST} = 1\text{MHz}$	f_T	3	-	MHz
Small Signal Current Gain $I_C = 500\text{mA}$, $V_{CE} = 10\text{V}$, $f = 1\text{kHz}$	h_{FE}	20	-	-

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

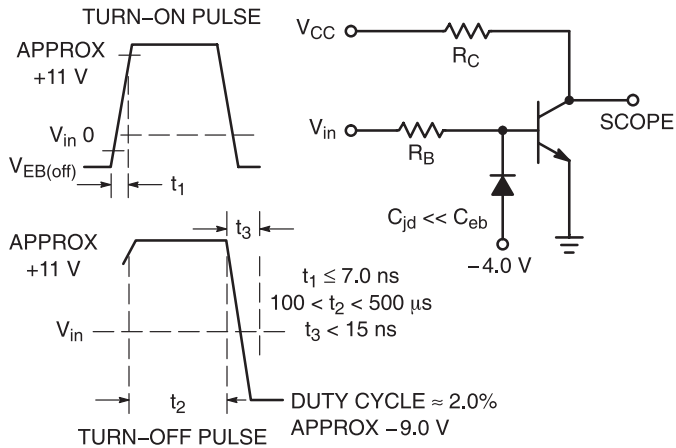
(2) $f_T = h_{FE} \cdot f_{TEST}$

Figure - 1 Power Derating



High Power Bipolar Transistor

Figure - 2 Switching Time Equivalent Circuit



R_B and R_C Varied to Obtain Desired Current Levels

Figure - 3 Turn-On Time

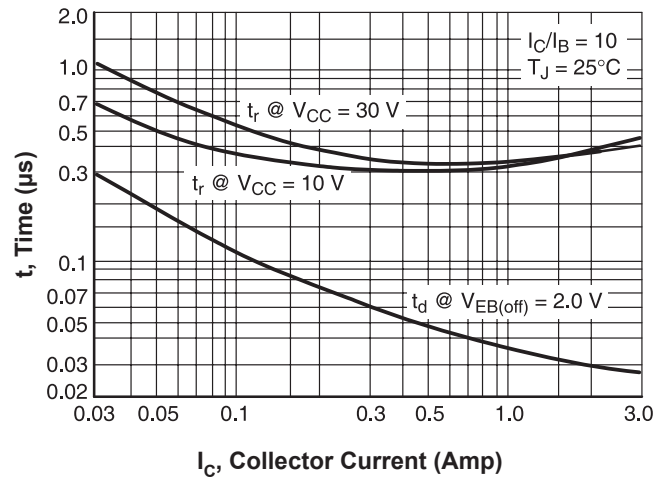


Figure - 4 DC Current Gain

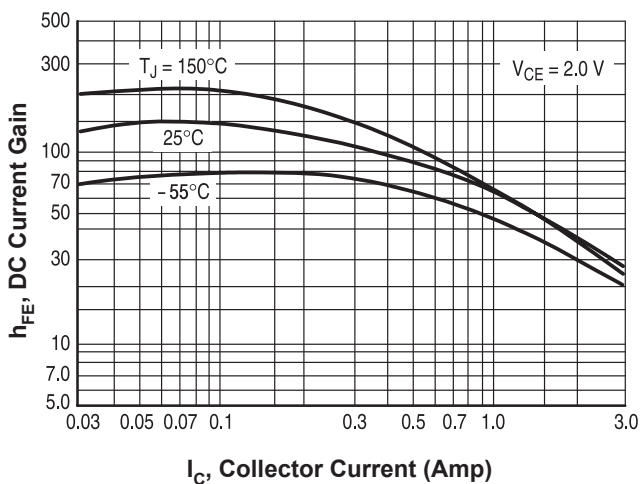
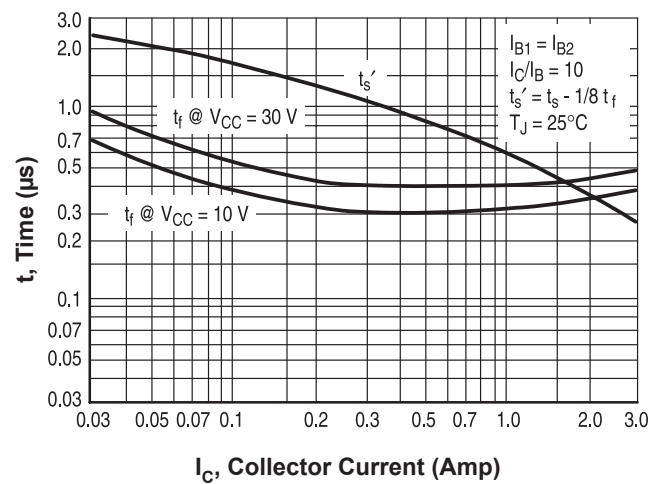
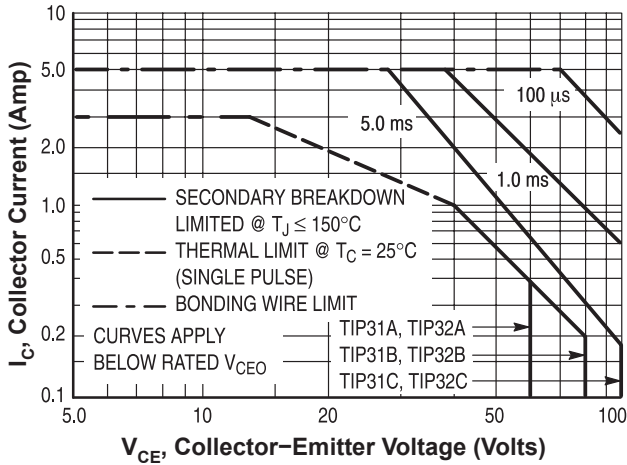


Figure - 5 Turn-Off Time



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

Figure - 7 Collector Saturation Region

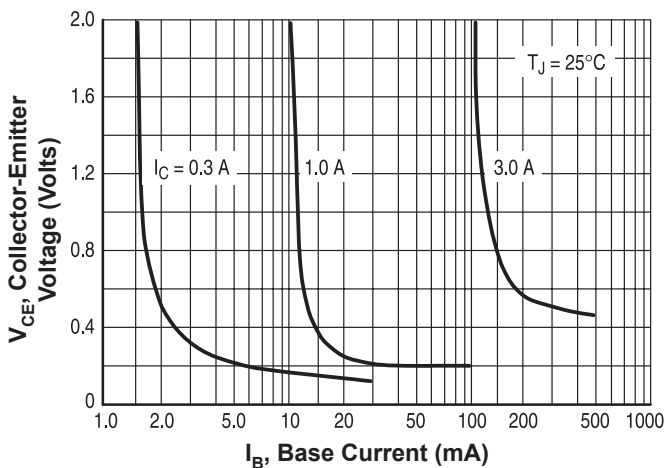


Figure - 8 Capacitances

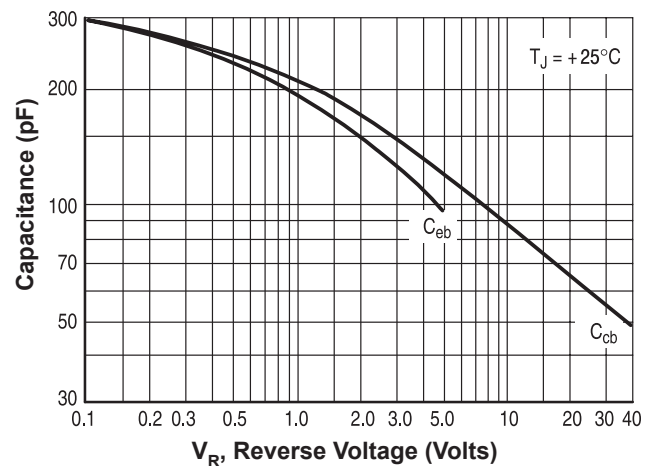


Figure - 9 "ON" Voltage

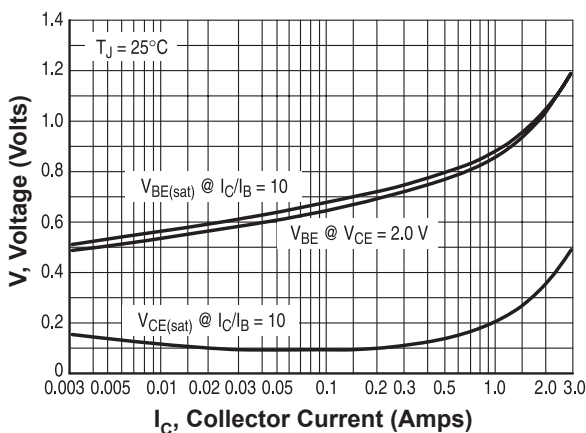
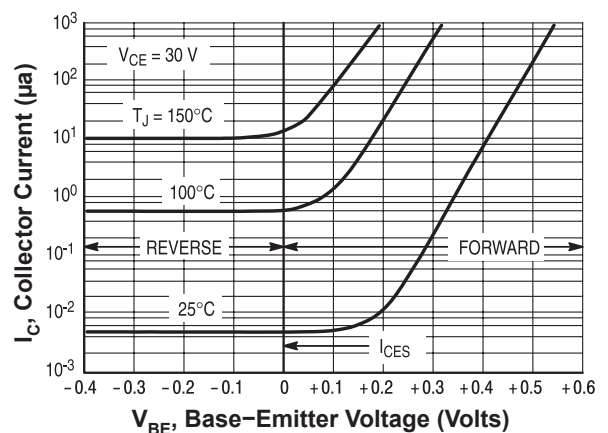
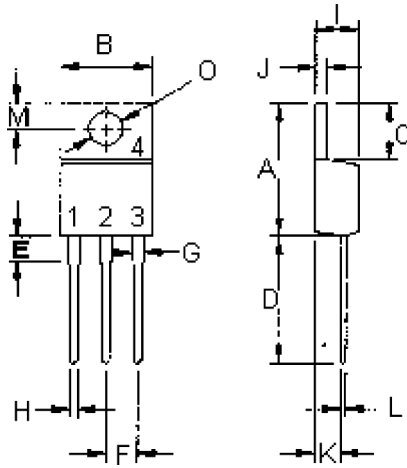


Figure - 10 Collector Cut-off Region



High Power Bipolar Transistor



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

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