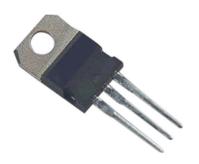
### High Power Bipolar Transistor





#### Features:

- Collector-Emitter sustaining voltage V<sub>CEO(sus)</sub> = 60V (Min.) TIP31A, TIP32A
   = 100V (Min.) TIP31C, TIP32C
- Collector-Emitter saturation voltage  $V_{CE(sat)} = 1.2V \text{ (Max.)}$  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 <sub>CEO</sub>	00	100	٧
Collector-Base Voltage	V <sub>CBO</sub>	60	100	
Emitter-Base Voltage	V <sub>EBO</sub>	5		
Collector Current-Continuous -Peak	I <sub>c</sub>	3 5		А
Base Current	I <sub>B</sub>	1		
Total Power Dissipation at T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	40 0.32		W/°C
Operation and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to	+150	°C

#### **Thermal Characteristics**

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



## High Power Bipolar Transistor

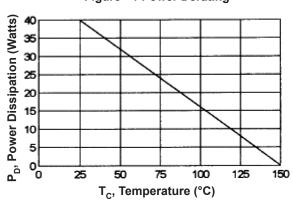


### Electrical Characteristics (T<sub>C</sub> = 25°C unless otherwise noted)

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

<sup>(1)</sup> Pulse Test: Pulse width ≤300µs, Duty Cycle ≤2%

Figure - 1 Power Derating



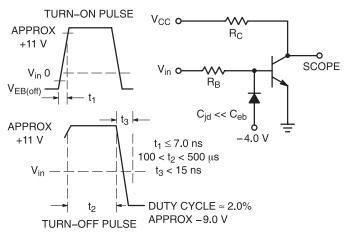


<sup>(2)</sup>  $f_T = h_{FE} \cdot f_{TEST}$ 

# High Power Bipolar Transistor Multicomp PRO



Figure - 2 Switching Time Equivalent Circuit



 $R_{\rm B}$  and  $R_{\rm C}$  Varied to Obtain Desired Current Levels

Figure - 3 Turn-On Time 2.0  $I_{\rm C}/I_{\rm B}=10$  $T_J = 25^{\circ}C$ 1.0 0.7  $t_r @ V_{CC} = 30 V$ 0.5 0.3  $t_r @ V_{CC} = 10 V$ 0.1 0.07  $t_{d} @ V_{EB(off)} = 2.0 V$ 0.05 0.03

I<sub>c</sub>, Collector Current (Amp)

0.3

0.5

1.0

3.0

Figure - 4 DC Current Gain

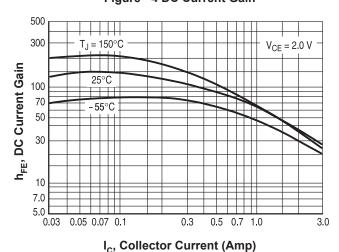
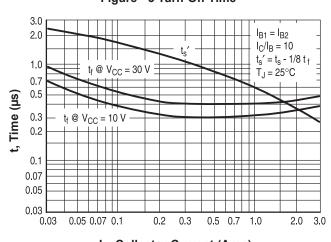


Figure - 5 Turn-Off Time



I<sub>C</sub>, Collector Current (Amp)

Newark.com/multicomp-pro Farnell.com/multicomp-pro Element14.com/multicomp-pro



t, Time (µs)

0.03

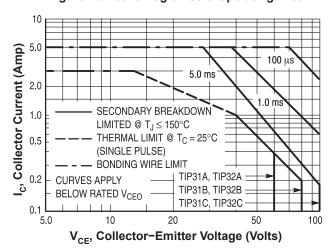
0.05

0.1

### **High Power Bipolar Transistor**

# multicomp PRO

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  $T_{J(PK)} = 150^{\circ}C$ ;  $T_C$  is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(PK)} \leq 150^{\circ}C$ , 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

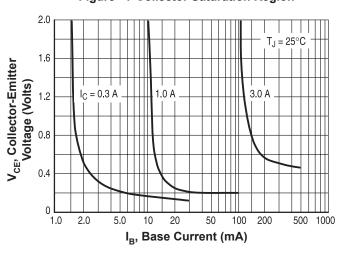


Figure - 8 Capacitances

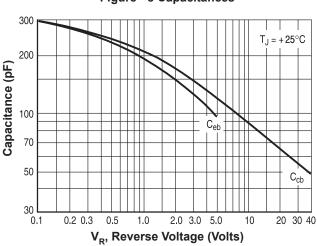


Figure - 9 "ON" Voltage

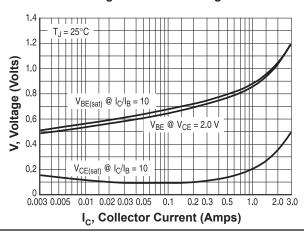
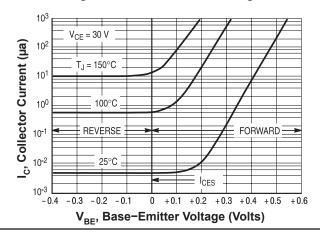


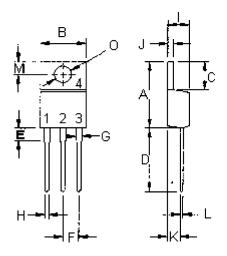
Figure - 10 Collector Cut-off Region





# High Power Bipolar Transistor Multicomp PRO





#### Pin Configuration:

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

Dimensions	Min.	Max.
А	14.68	15.31
В	9.78	10.42
С	5.01	6.52
D	13.06	14.62
E	3.57	4.07
F	2.42	3.66
G	1.12	1.36
Н	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
0	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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