

# TIP31, TIP32



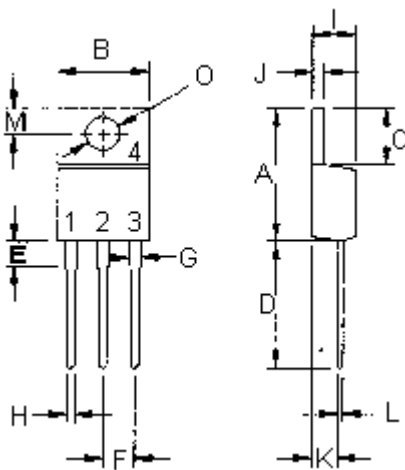
## High Power Bipolar Transistors



### Features:

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

TO-220



- 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**  
**TIP31A**  
**TIP32C**

**PNP**  
**TIP32A**  
**TIP32C**

**3 Amperes**  
**Complementary Silicon**  
**Power Transistors**  
**60 - 100 Volts**  
**40 Watts**

### 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		A
Collector current - continuous	$I_C$	3		
- peak		5		
Base current	$I_B$	1		
Total power dissipation at $t_c = 25^\circ\text{C}$ derate above $25^\circ\text{C}$	$P_D$	40	0.32	W W/ $^\circ\text{C}$
Operating and storage junction temperature range	$T_J, T_{STG}$	-65 to +150		$^\circ\text{C}$

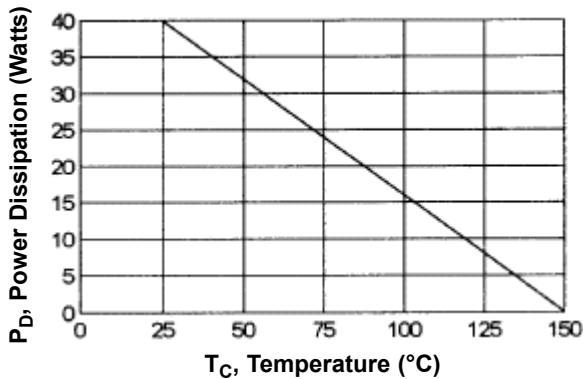
### Thermal Characteristics

Characteristic	Symbol	Maximum	Unit
Thermal resistance junction to case	$R_{\theta jc}$	3.125	$^\circ\text{C}/\text{W}$

# TIP31, TIP32

## High Power Bipolar Transistors

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) ( $I_C = 30\text{ mA}$ , $I_B = 0$ ) 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	
<b>ON Characteristics (1)</b>				
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 15	- 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	
<b>Dynamic Characteristics</b>				
Current gain - bandwidth product (2) ( $I_C = 500\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f_{TEST} = 1\text{ KHz}$ )	$f_T$	3	-	MHz
Small - signal current gain ( $I_C = 500\text{ A}$ , $V_{CE} = 10\text{ V}$ , $f = 1\text{ kHz}$ )	$h_{fe}$	20	-	-

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

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

# TIP31, TIP32



## High Power Bipolar Transistors

Figure - 2 Switching Time Equivalent Circuit

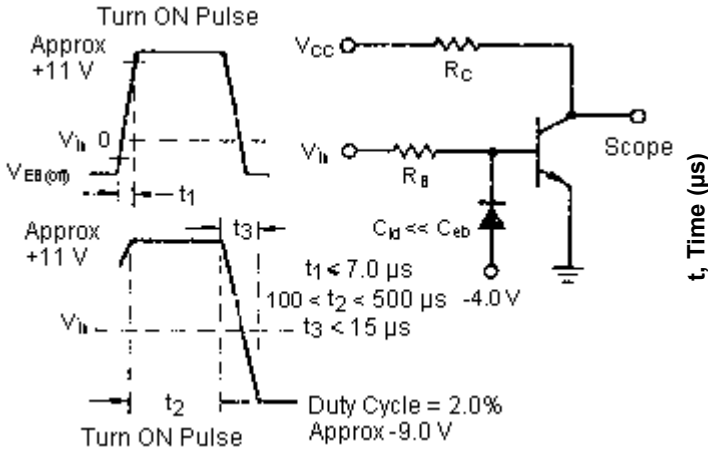


Figure - 3 Turn-On Time

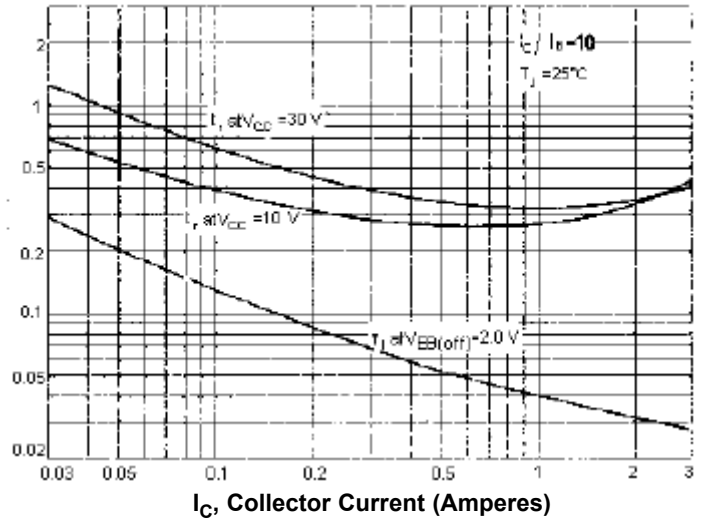


Figure - 4 DC Current Gain

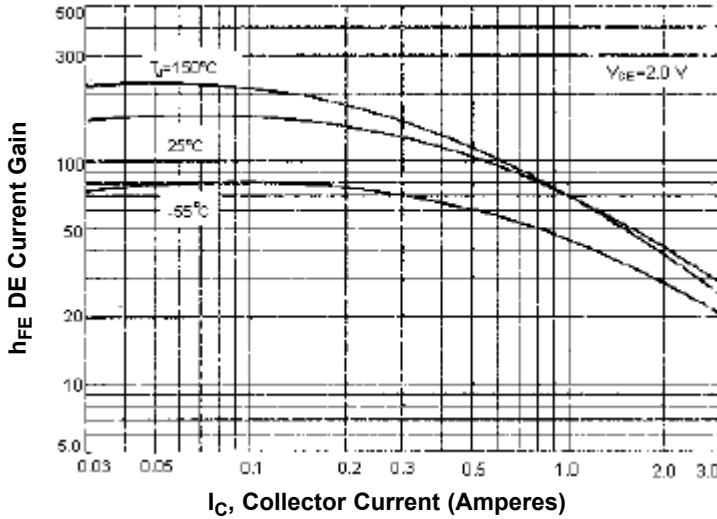


Figure - 5 Turn-Off Time

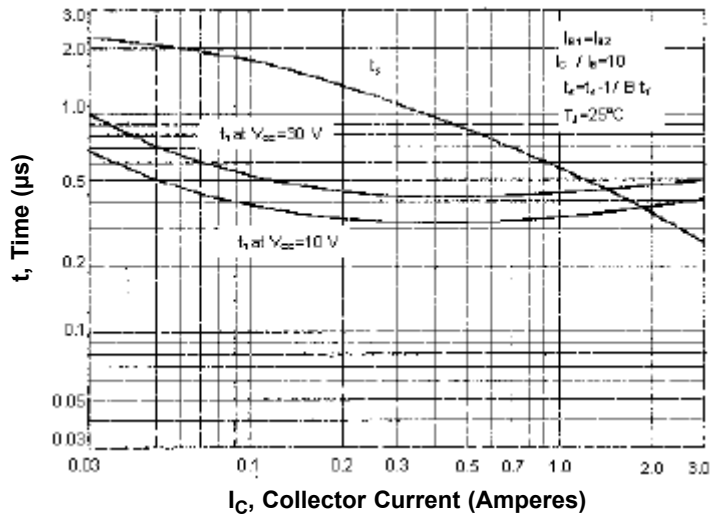
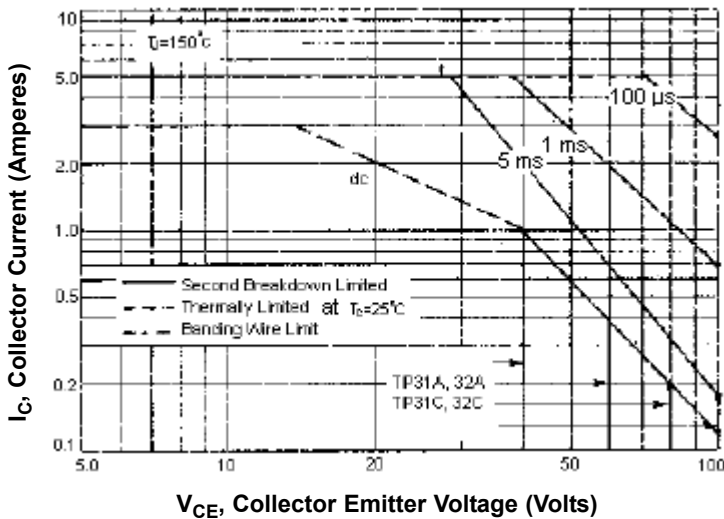


Figure - 6 Active Region Safe Operating Area



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  $T_{J(PK)} = 150^\circ\text{C}$ ;  $T_C$  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



# TIP31, TIP32

## High Power Bipolar Transistors



Figure - 7 Collector Saturation Region

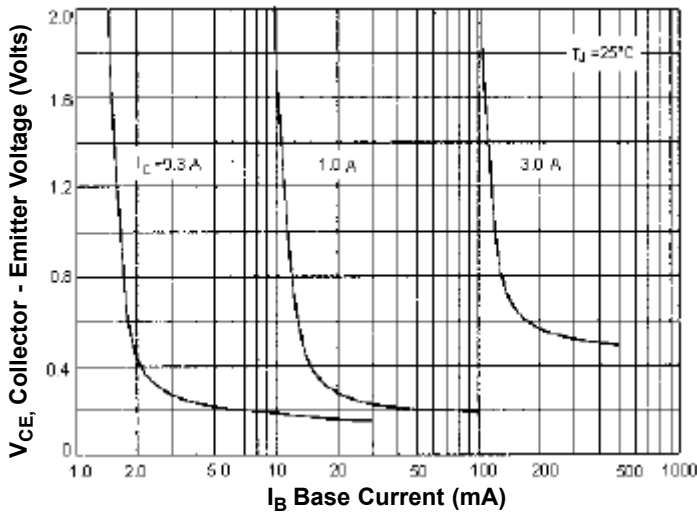


Figure - 8 Capacitances

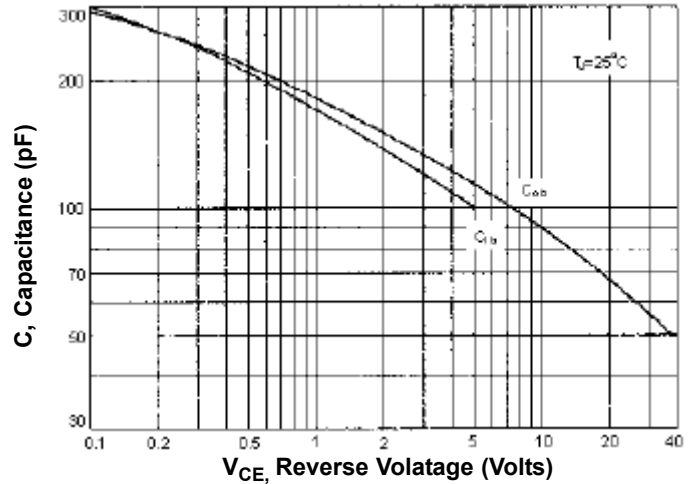


Figure - 9 "ON" Voltage

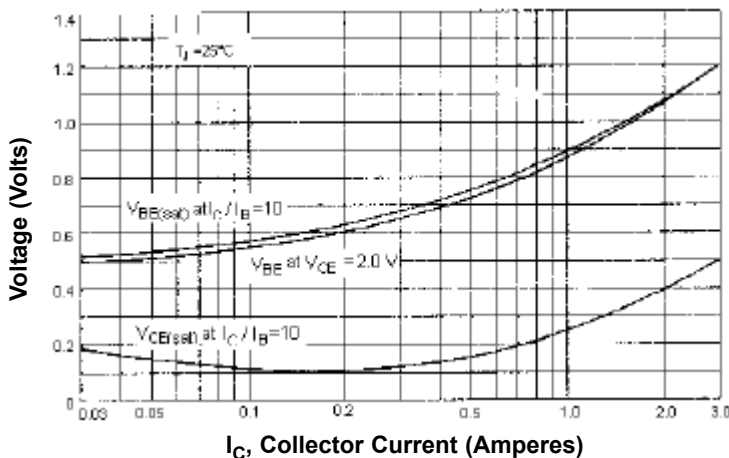
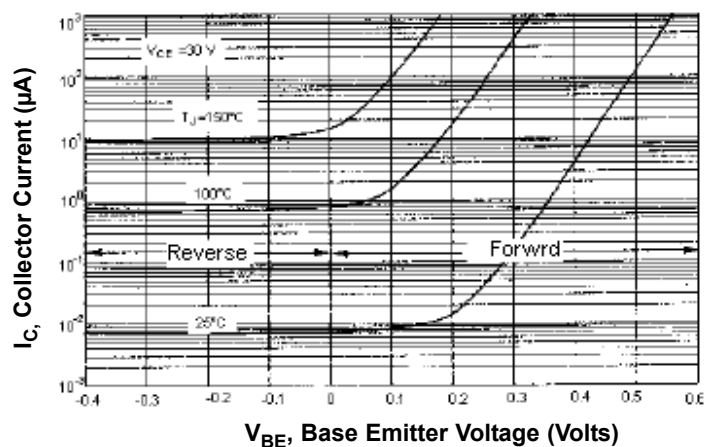


Figure - 10 Collector Cut-off Region



### Part Number Table

Description	Type	Part Number
High Power Bipolar Transistor	NPN	TIP31A
High Power Bipolar Transistor		TIP31C
High Power Bipolar Transistor	PNP	TIP32A
High Power Bipolar Transistor		TIP32C

**Important Notice :** This data sheet and its contents (the "Information") belong to the members of the Premier Farnell group of companies (the "Group") or are licensed to it. No licence is granted for the use of it other than for information purposes in connection with the products to which it relates. No licence of any intellectual property rights is granted. The Information is subject to change without notice and replaces all data sheets previously supplied. The Information supplied is believed to be accurate but the Group assumes no responsibility for its accuracy or completeness, any error in or omission from it or for any use made of it. Users of this data sheet should check for themselves the Information and the suitability of the products for their purpose and not make any assumptions based on information included or omitted. Liability for loss or damage resulting from any reliance on the Information or use of it (including liability resulting from negligence or where the Group was aware of the possibility of such loss or damage arising) is excluded. This will not operate to limit or restrict the Group's liability for death or personal injury resulting from its negligence. Multicomp is the registered trademark of the Group. © Premier Farnell plc 2011.