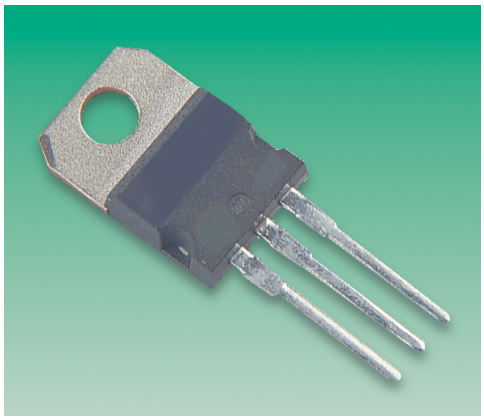
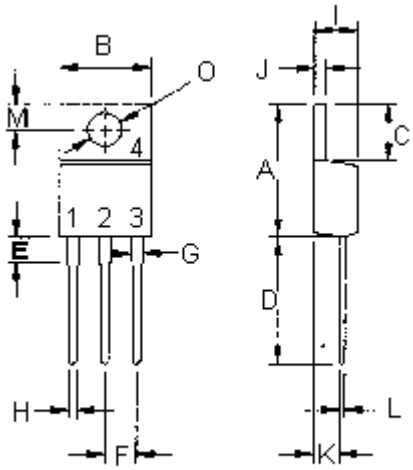
TIP31, TIP32

High Power Bipolar Transistor



Features:

- Collector-Emitter sustaining voltage -
  $V_{CEO(sus)}$ = 60V (Minimum) - TIP31A, TIP32A
  = 100V (Minimum) - TIP31C, TIP32C.
- Collector-Emitter saturation voltage -
  $V_{CE(sat)}$ = 1.2V (Maximum) at I_C = 3.0A.
- Current gain-bandwidth product f_T = 3.0MHz (Minimum) at I_C = 500mA.



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	2.20	2.97
L	0.33	0.55
M	2.48	2.98
O	3.70	3.90

Dimensions : Millimetres

NPN	PNP
TIP31A	TIP32A
TIP32C	TIP32C

3 Ampere
Complementary Silicon
Power Transistors
60 - 100 Volts
40 Watts

TO-220

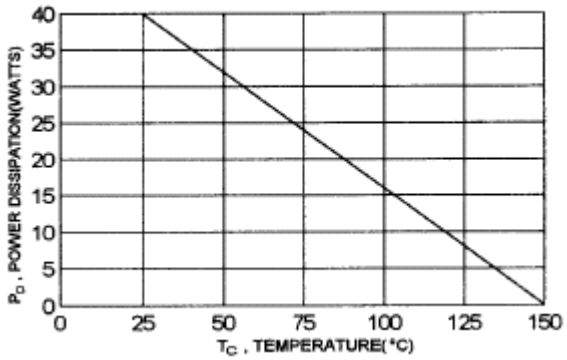
Maximum Ratings

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}	5.0		
Collector Current-Continuous -Peak	I_C	3.0 5.0		A
Base Current	I_B	1.0		
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	Maximum	Unit
Thermal Resistance Junction to case	$R_{\theta jc}$	3.125	°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 = 30mA, I_B = 0)	TIP31A, TIP32A TIP31C, TIP32C	$V_{CEO(sus)}$	60 100	-	V
Collector Cut off Current (V_{CE} = 30V, I_B = 0) (V_{CE} = 60V, I_B = 0)	TIP31A, TIP32A TIP31C, TIP32C	I_{CEO}	-	0.3	mA
Collector Cut off Current (V_{CE} = 60V, V_{EB} = 0) (V_{CE} = 100V, V_{EB} = 0)	TIP31A, TIP32A TIP31C, TIP32C	I_{CES}	-	0.2	
Emitter Cut off Current (V_{EB} = 5.0V, I_C = 0)		I_{EBO}	-	1.0	
ON Characteristics (1)					
DC Current Gain (I_C = 1.0A, V_{CE} = 4.0V) (I_C = 3.0A, V_{CE} = 4.0V)		h_{FE}	25 10	- 50	-
Collector-Emitter Saturation Voltage (I_C = 3.0A, I_B = 375mA)		$V_{CE(sat)}$	-	1.2	V
Base-Emitter On Voltage (I_C = 3.0A, V_{CE} = 4.0V)		$V_{BE(on)}$	-	1.8	
Dynamic Characteristics					
Current Gain-Bandwidth Product (2) (I_C = 500mA, V_{CE} = 10V, f_{TEST} = 1MHz)		f_T	3.0	-	MHz
Small Signal Current Gain (I_C = 500mA, V_{CE} = 10V, f = 1kHz)		h_{FE}	20	-	-

(1) Pulse Test: Pulse width ≤300µs, Duty Cycle ≤2.0%

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

Figure - 2 Switching Time Equivalent Circuit

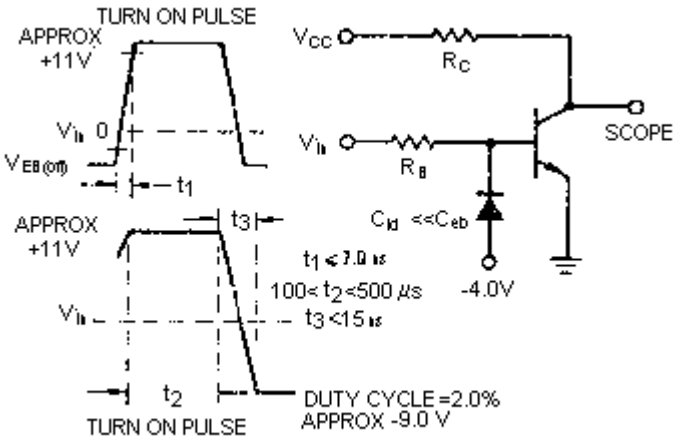


Figure - 3 Turn-On Time

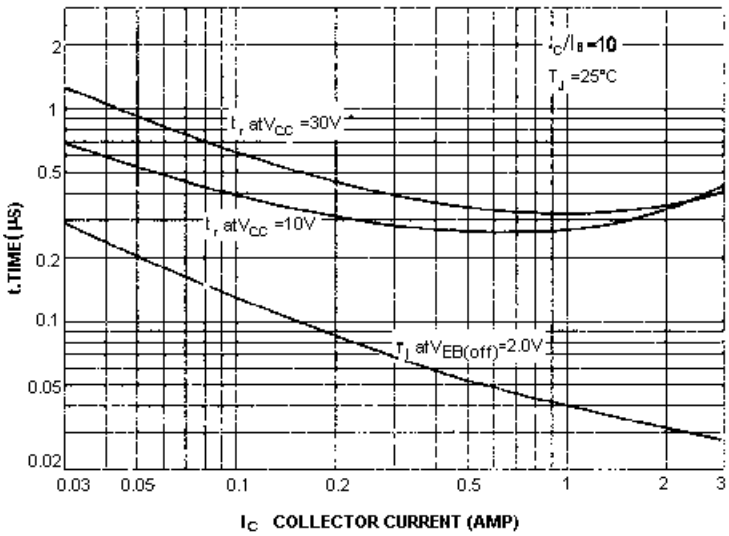


Figure - 4 DC Current Gain

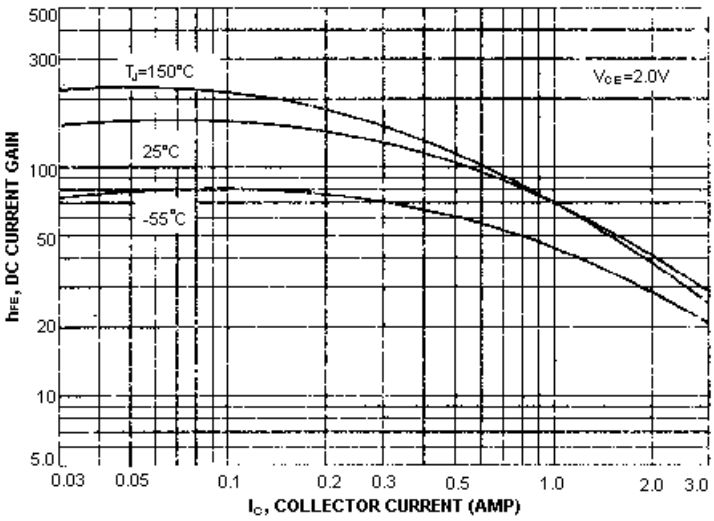


Figure - 5 Turn-Off Time

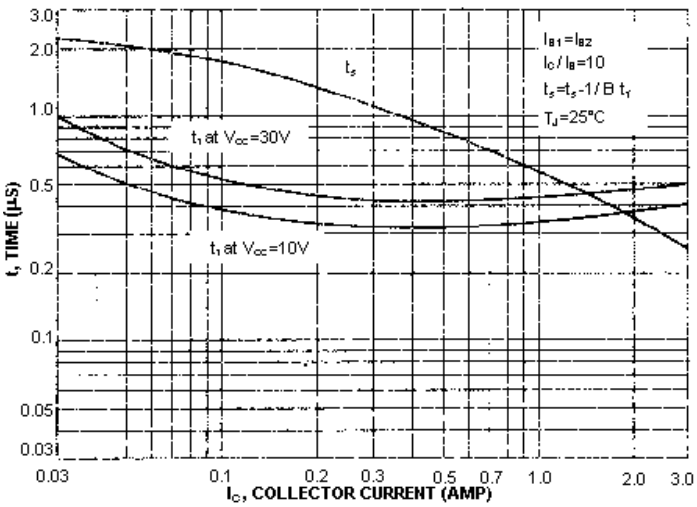
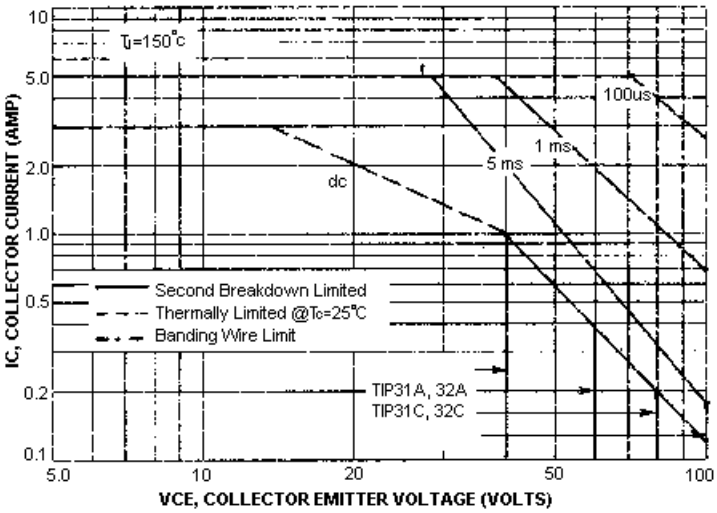


Figure - 6 Active Region Safe Operating Area



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°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

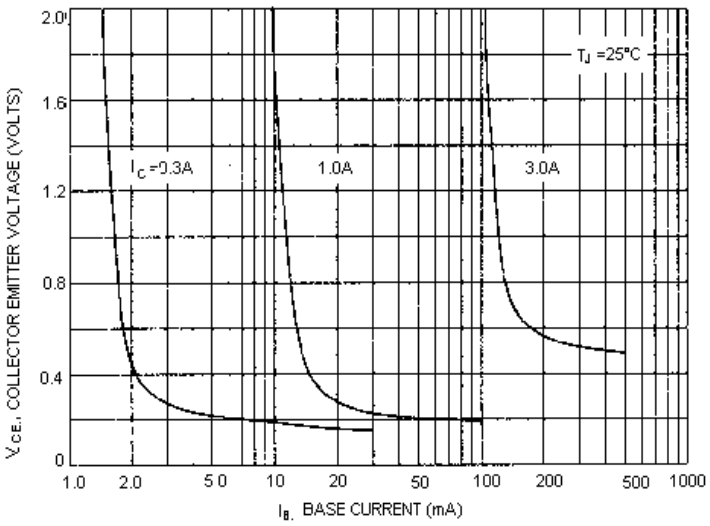


Figure - 8 Capacitances

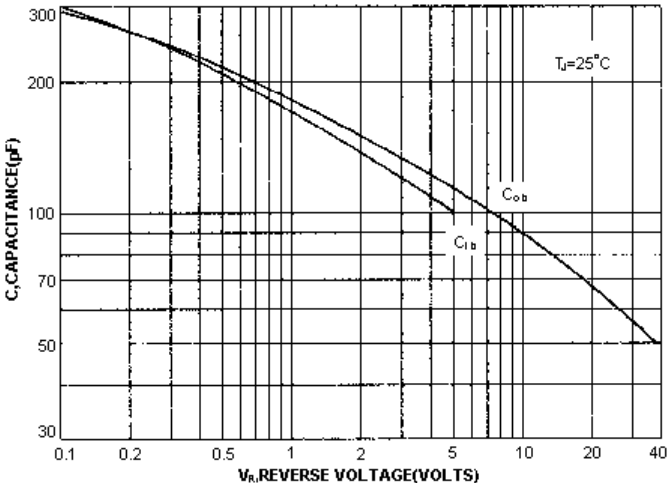


Figure - 9 “ON” Voltage

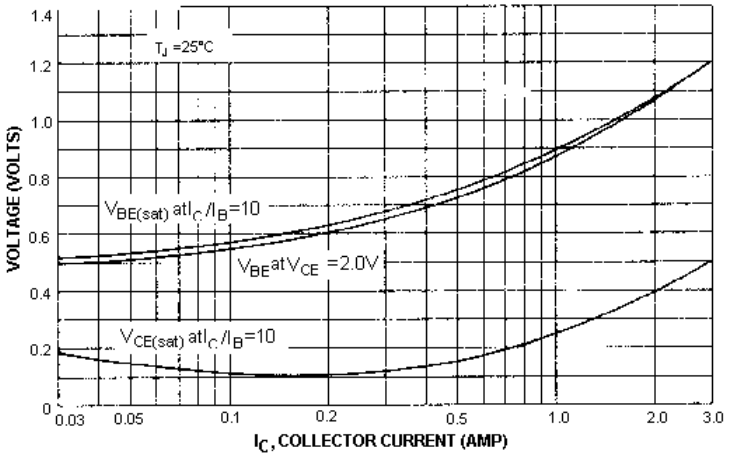
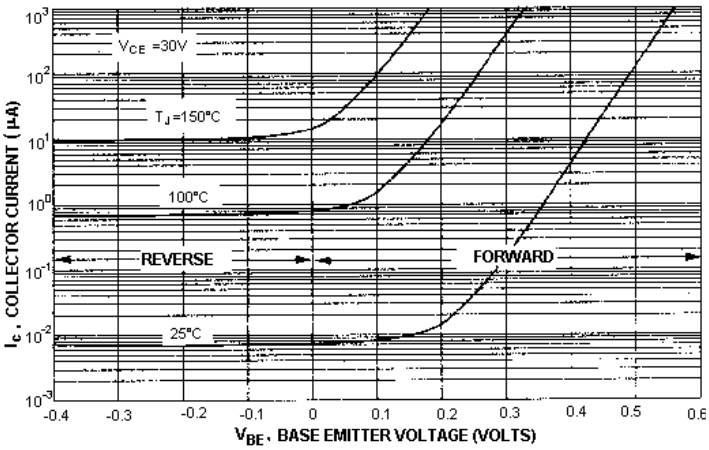


Figure - 10 Collector Cut-off Region



Specifications

TYPE	Part Number
NPN	TIP31A
	TIP31C
PNP	TIP32A
	TIP32C

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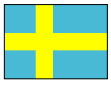

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