

TIP31, TIP31A, TIP31B, TIP31C, (NPN), TIP32, TIP32A, TIP32B, TIP32C, (PNP)

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.125	°C/W

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 (Note 2) ($I_C = 30\text{ mAdc}$, $I_B = 0$)	TIP31, TIP32 TIP31A, TIP32A TIP31B, TIP32B TIP31C, TIP32C	$V_{CE(sus)}$	40 60 80 100	– – – –	Vdc
Collector Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$)	TIP31, TIP32, TIP31A, TIP32A TIP31B, TIP31C, TIP32B, TIP32C	I_{CEO}	– –	0.3 0.3	mAdc
Collector Cutoff Current ($V_{CE} = 40\text{ Vdc}$, $V_{EB} = 0$) ($V_{CE} = 60\text{ Vdc}$, $V_{EB} = 0$) ($V_{CE} = 80\text{ Vdc}$, $V_{EB} = 0$) ($V_{CE} = 100\text{ Vdc}$, $V_{EB} = 0$)	TIP31, TIP32 TIP31A, TIP32A TIP31B, TIP32B TIP31C, TIP32C	I_{CES}	– – – –	200 200 200 200	μAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)		I_{EBO}	–	1.0	mAdc

ON CHARACTERISTICS (Note 2)

DC Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)	h_{FE}	25 10	– 50	–
Collector-Emitter Saturation Voltage ($I_C = 3.0\text{ Adc}$, $I_B = 375\text{ mAdc}$)	$V_{CE(sat)}$	–	1.2	Vdc
Base-Emitter On Voltage ($I_C = 3.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$)	$V_{BE(on)}$	–	1.8	Vdc

DYNAMIC CHARACTERISTICS

Current-Gain – Bandwidth Product ($I_C = 500\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$)	f_T	3.0	–	MHz
Small-Signal Current Gain ($I_C = 0.5\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	20	–	–

2. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

TIP31, TIP31A, TIP31B, TIP31C, (NPN), TIP32, TIP32A, TIP32B, TIP32C, (PNP)

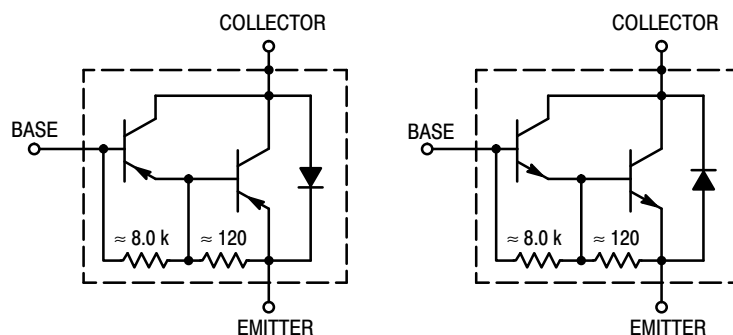


Figure 1. Darlington Circuit Schematic

ORDERING INFORMATION

Device	Package	Shipping
TIP31	TO-220	50 Units / Rail
TIP31G	TO-220 (Pb-Free)	50 Units / Rail
TIP31A	TO-220	50 Units / Rail
TIP31AG	TO-220 (Pb-Free)	50 Units / Rail
TIP31B	TO-220	50 Units / Rail
TIP31BG	TO-220 (Pb-Free)	50 Units / Rail
TIP31C	TO-220	50 Units / Rail
TIP31CG	TO-220 (Pb-Free)	50 Units / Rail
TIP32	TO-220	50 Units / Rail
TIP32G	TO-220 (Pb-Free)	50 Units / Rail
TIP32A	TO-220	50 Units / Rail
TIP32AG	TO-220 (Pb-Free)	50 Units / Rail
TIP32B	TO-220	50 Units / Rail
TIP32BG	TO-220 (Pb-Free)	50 Units / Rail
TIP32C	TO-220	50 Units / Rail
TIP32CG	TO-220 (Pb-Free)	50 Units / Rail

TIP31, TIP31A, TIP31B, TIP31C, (NPN), TIP32, TIP32A, TIP32B, TIP32C, (PNP)

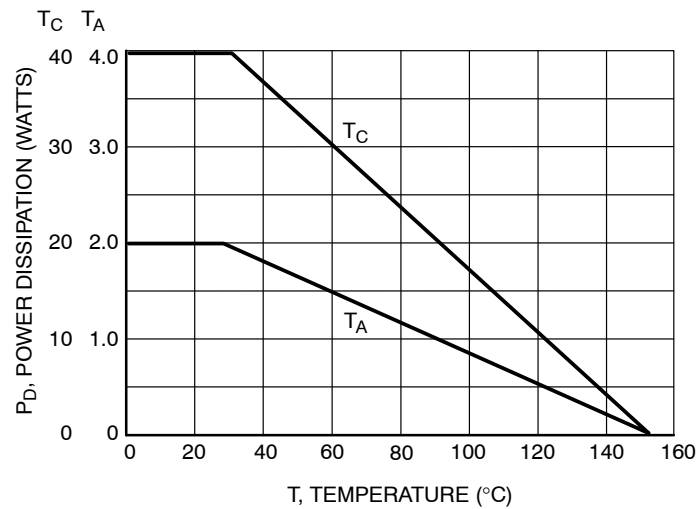
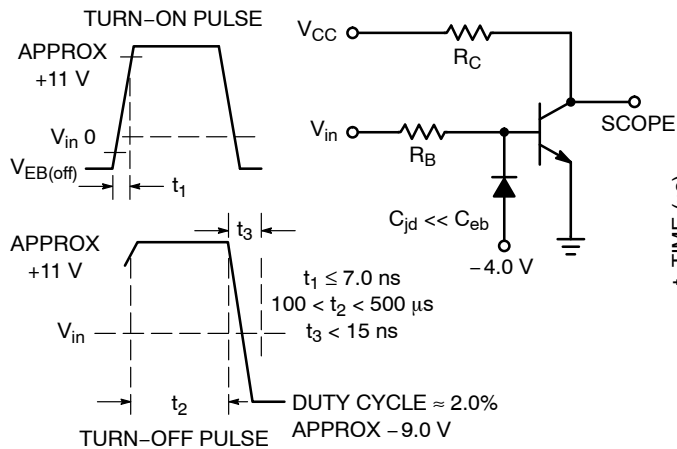


Figure 2. Power Derating



R_B and R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS.

Figure 3. Switching Time Equivalent Circuit

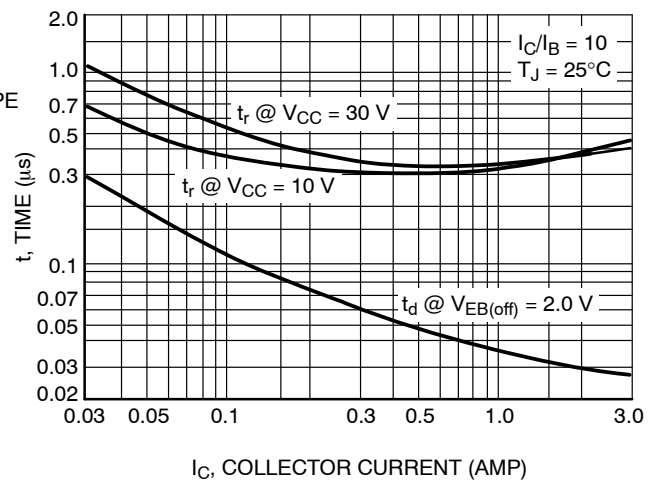


Figure 4. Turn-On Time

TIP31, TIP31A, TIP31B, TIP31C, (NPN), TIP32, TIP32A, TIP32B, TIP32C, (PNP)

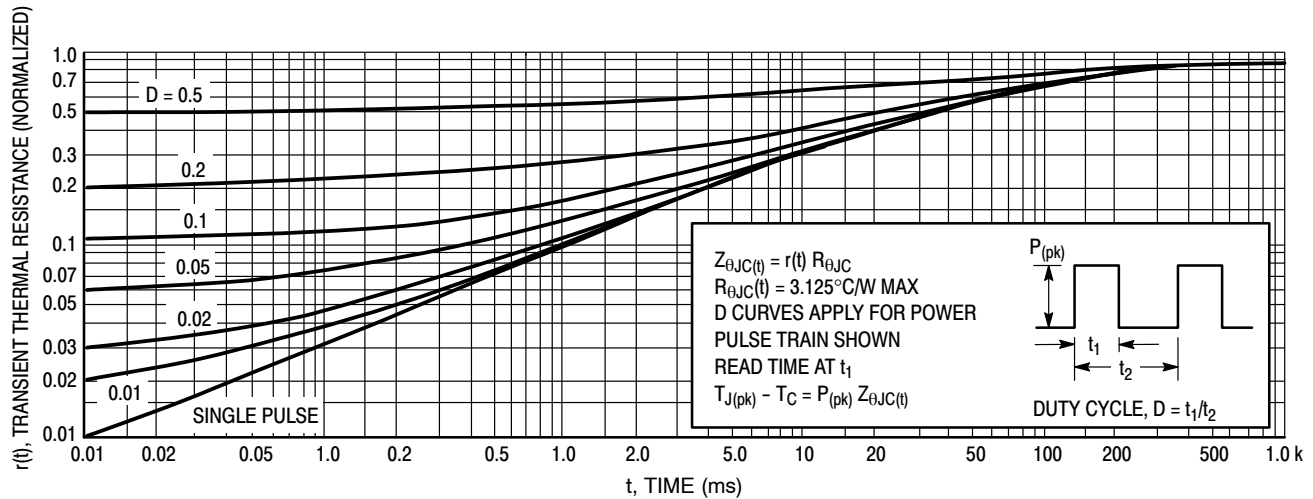


Figure 5. Thermal Response

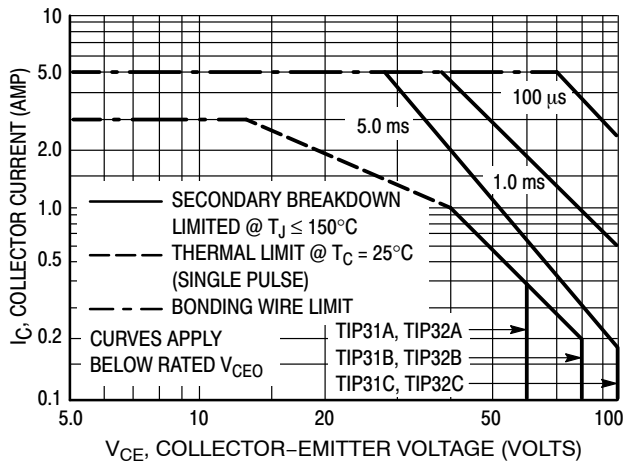


Figure 6. Active Region Safe Operating Area

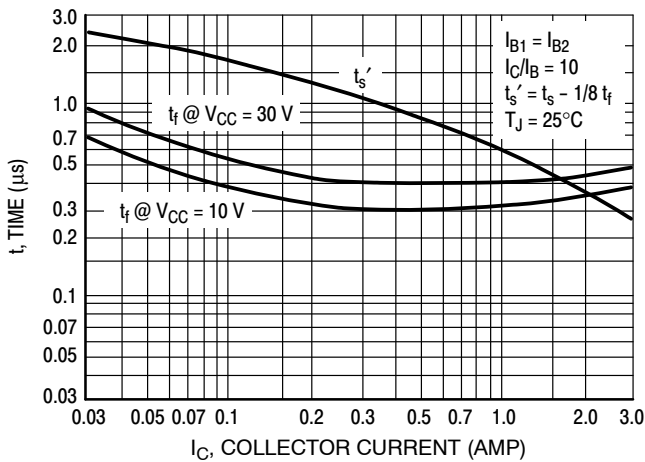


Figure 7. Turn-Off Time

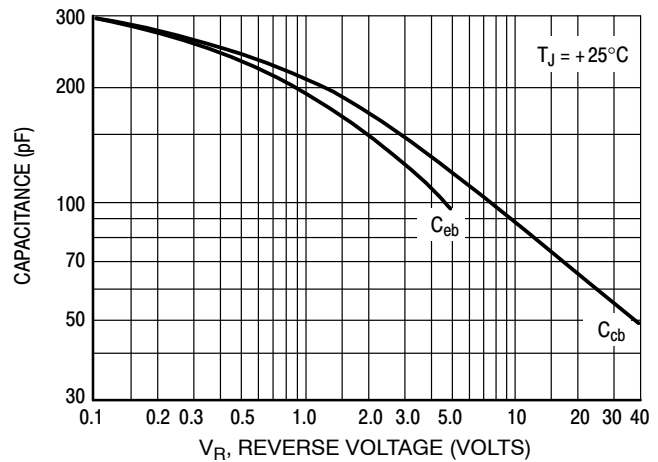


Figure 8. Capacitance

TIP31, TIP31A, TIP31B, TIP31C, (NPN), TIP32, TIP32A, TIP32B, TIP32C, (PNP)

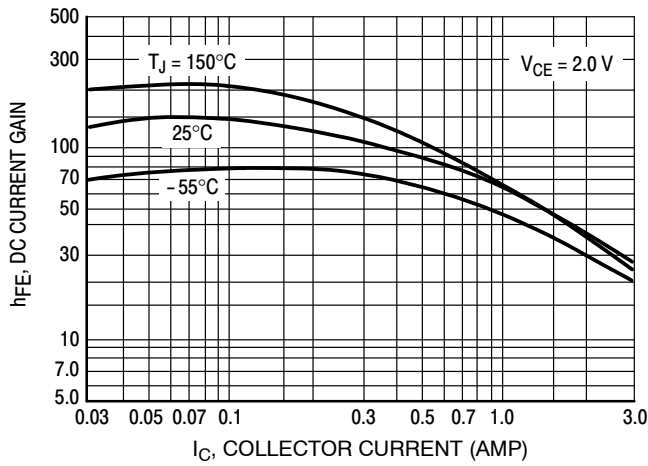


Figure 9. DC Current Gain

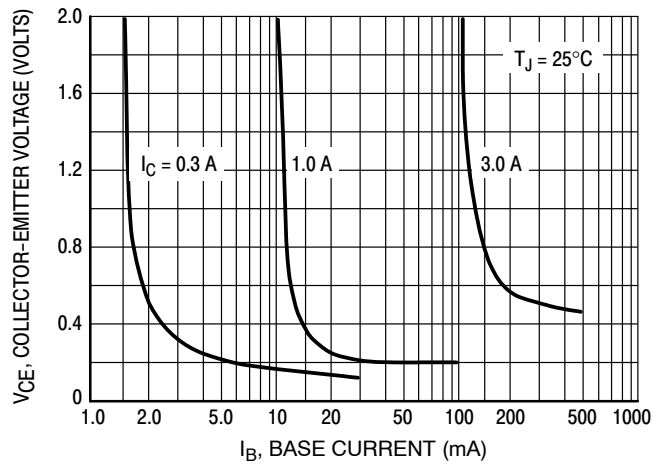


Figure 10. Collector Saturation Region

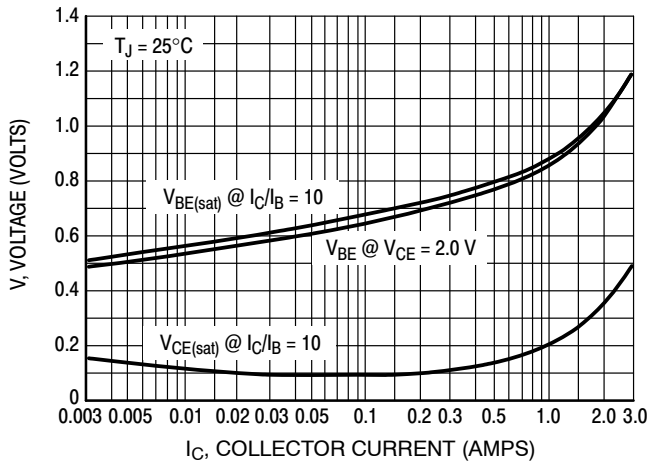


Figure 11. "On" Voltages

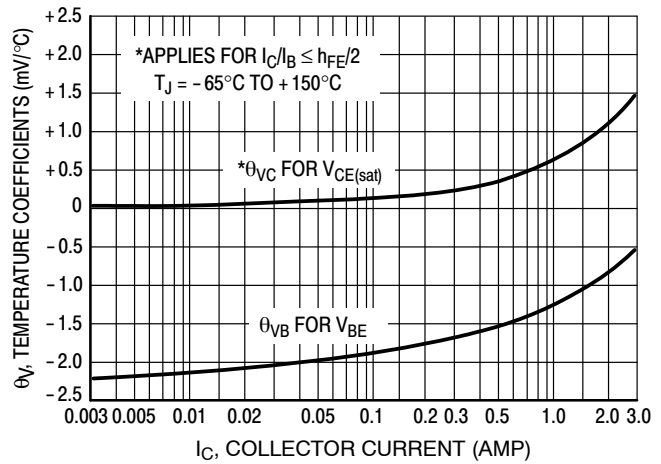


Figure 12. Temperature Coefficients

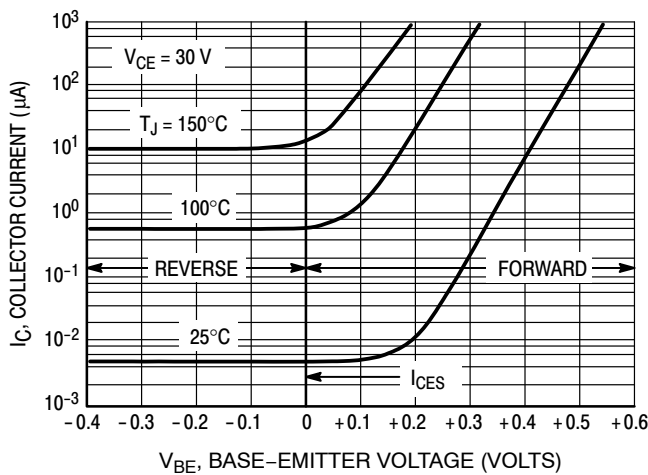


Figure 13. Collector Cut-Off Region

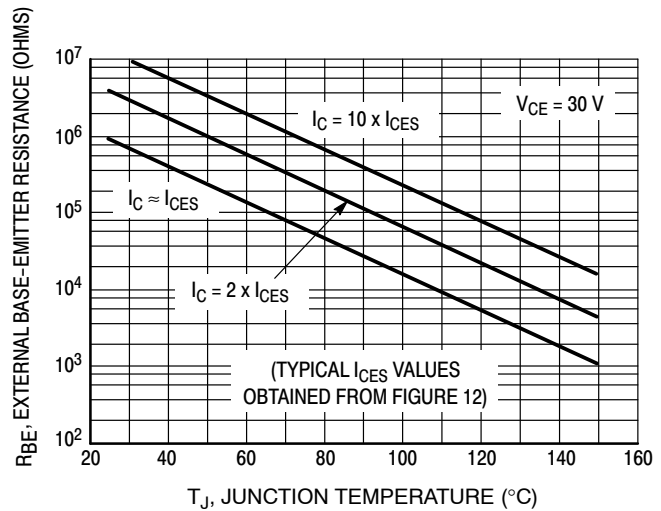
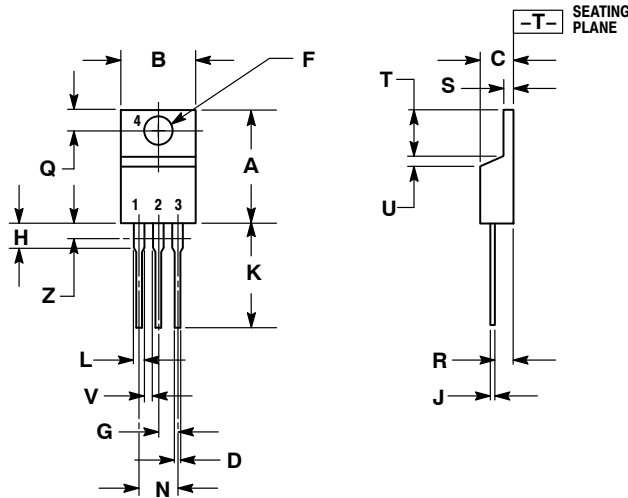


Figure 14. Effects of Base-Emitter Resistance

TIP31, TIP31A, TIP31B, TIP31C, (NPN), TIP32, TIP32A, TIP32B, TIP32C, (PNP)

PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AG



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 1:

1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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TIP31A/D