

Epitaxial-Base, Silicon N-P-N VERSAWATT Transistors

For Power-Amplifier and High-Speed-Switching Applications

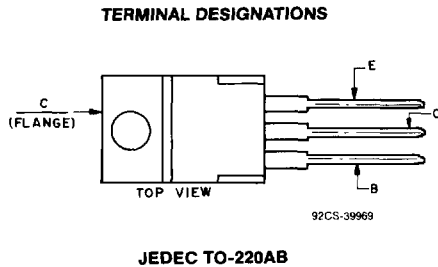
Features:

- 40 W at 25°C case temperature
- 5 A rated collector current
- Min. f_T of 3 MHz at 10 V, 500 mA
- Designed for complementary use with TIP32-series p-n-p types*

The RCA-TIP31, TIP31A, TIP31B, and TIP31C are epitaxial-base, silicon n-p-n transistors intended for a wide variety of switching and amplifier applications, such as series and shunt regulators and driver and output stages of high-fidelity amplifiers. These power transistors are designed for complementary use with devices in the TIP32 series. They differ from each other in voltage ratings.

They are supplied in the JEDEC TO-220AB (VERSAWATT) plastic package.

* Technical data for the TIP32-series devices are given in RCA data bulletin File No. 987



MAXIMUM RATINGS, Absolute-Maximum Values:

	TIP31	TIP31A	TIP31B	TIP31C	
V_{CBO}	40	60	80	100	V
V_{CEO}	40	60	80	100	V
V_{EBO}	5	5	5	5	V
I_C	5	5	5	5	A
I_B	1	1	1	1	A
P_T :					
At $T_C \leq 25^\circ\text{C}$	40	40	40	40	W
At $T_A \leq 25^\circ\text{C}$	2	2	2	2	W
At $T_C > 25^\circ\text{C}$	Derate linearly			0.32	W/°C
T_{stg}, T_J	-65 to 150				°C
T_L (During soldering):					
At distance 1/8 in. (3.17 mm)					
from case for 10 s max.	235				°C

TIP31, TIP31A, TIP31B, TIP31C

ELECTRICAL CHARACTERISTICS, At Case Temperature (T_C) = 25°C unless otherwise specified

CHARACTERISTIC	TEST COND.		LIMITS								Units
	VOLTAGE V dc	CUR. RENT A dc	TIP31		TIP31A		TIP31B		TIP31C		
	VCE	IC	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
I_{CE0} $I_B=0$	30		–	0.3	–	0.3	–	–	–	–	mA
	60		–	–	–	–	–	0.3	–	0.3	
I_{CES} $V_{EB}=0$	40		–	0.2	–	–	–	–	–	–	mA
	60		–	–	–	0.2	–	–	–	–	
	80		–	–	–	–	–	0.2	–	–	
	100		–	–	–	–	–	–	–	0.2	
I_{EBO} $V_{BE}=-5V$		0	–	1	–	1	–	1	–	1	mA
$V_{CE0(sus)}$ $I_B=0$		0.03 ^a	40 ^b	–	60 ^b	–	80 ^b	–	100 ^b	–	V
h_{FE}	4	1 ^a	25	–	25	–	25	–	25	–	
	4	3 ^a	10	50	10	50	10	50	10	50	
V_{BE}	4	3 ^a	–	1.8	–	1.8	–	1.8	–	1.8	V
$V_{CE(sat)}$ $I_B=$ 0.375A		3 ^a	–	1.2	–	1.2	–	1.2	–	1.2	V
h_{fe} $f=1$ kHz	10	0.5	20	–	20	–	20	–	20	–	
$ h_{fe} $ $f=1$ MHz	10	0.5	3	–	3	–	3	–	3	–	
t_{ON} (t_d+t_r) $V_{CC}=$ 30V $R_L=30\Omega$ $I_{B1}=I_{B2}$ =0.1A		1	0.4 (typ.)		0.4 (typ.)		0.4 (typ.)		0.4 (typ.)		μs
t_{OFF} (t_s+t_f) $V_{CC}=$ 30V $R_L=30\Omega$ $I_{B1}=-I_{B2}$ =0.1A		1	1.2 (typ.)		1.2 (typ.)		1.2 (typ.)		1.2 (typ.)		
$R_{\theta JC}$			–	3.125	–	3.125	–	3.125	–	3.125	$^{\circ}C/W$
$R_{\theta JA}$			–	62.5	–	62.5	–	62.5	–	62.5	

^a Pulsed, pulse duration = 300 μs , duty factor \leq 2%.

^b CAUTION: Sustaining voltage, $V_{CE0(sus)}$, MUST NOT be measured on a curve tracer.

TIP31, TIP31A, TIP31B, TIP31C

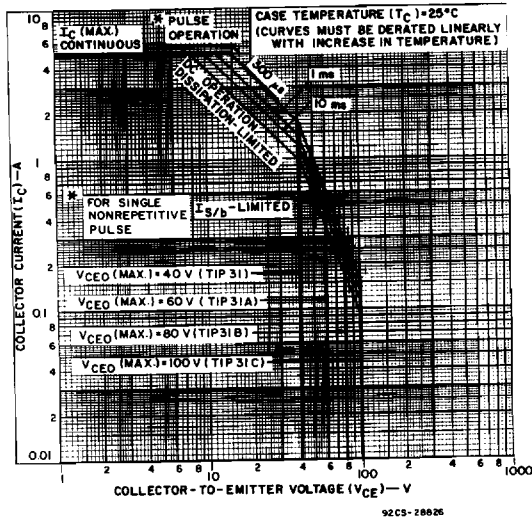


Fig. 1 — Maximum operating areas for all types.

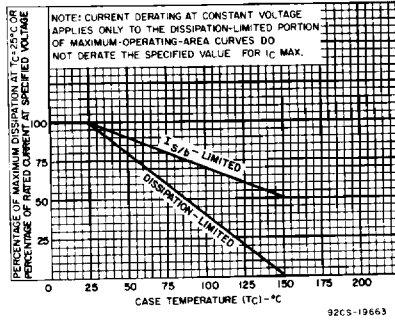


Fig. 2 — Derating curve for all types.

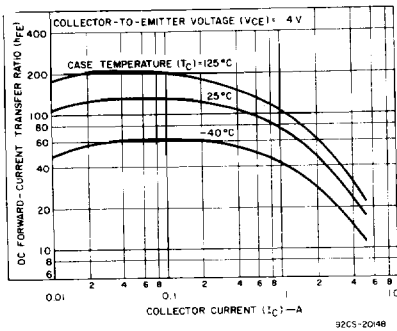


Fig. 3 — Typical dc beta characteristics for TIP31, TIP31A, and TIP31B.

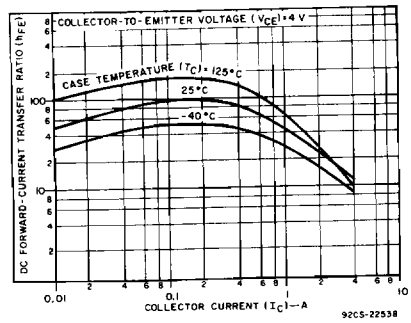
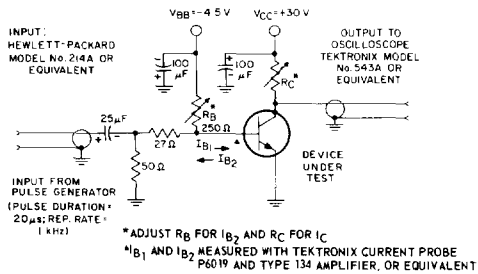


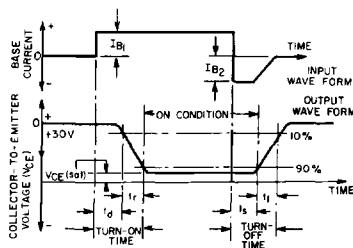
Fig. 4 — Typical dc beta characteristics for TIP31C.

TIP31, TIP31A, TIP31B, TIP31C



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Fig. 5 — Circuit used to measure saturated switching times for all types.



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Fig. 6 — Oscilloscope display for measurement of switching times.