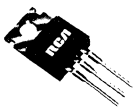
RCA
Solid State
Division

Power Transistors

RCA31 RCA31B
RCA31A RCA31C



JEDEC TO-220 AB H-1535

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 RCA32, RCA32A, RCA32B, and RCA32C p-n-p types***

RCA31, RCA31A, RCA31B, and RCA31C are epitaxial-base, silicon p-n-p transistors. They are 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 new plastic power transistors are designed for complementary use with devices in the RCA32 series. They differ from each other in voltage ratings.

* Technical data for the RCA32-series devices are given in RCA data bulletin File 586.

MAXIMUM RATINGS, *Absolute-Maximum Values:*		RCA31	RCA31A	RCA31B	RCA31C	
COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	40	60	80	100	V
COLLECTOR-TO-EMITTER VOLTAGE:						
With base open	V_{CEO}	40	60	80	100	V
EMITTER-TO-BASE VOLTAGE	V_{EBO}	5	5	5	5	V
CONTINUOUS COLLECTOR CURRENT	I_C	5	5	5	5	A
CONTINUOUS BASE CURRENT	I_B	1	1	1	1	A
TRANSISTOR DISSIPATION:	P_T					
At case temperatures up to 25°C		40	40	40	40	W
At ambient temperatures up to 25°C		2	2	2	2	W
TEMPERATURE RANGE:						
Storage and Operating (Junction)		←	-65 to 150		→	°C
LEAD TEMPERATURE (During Soldering):						
At distance 1/8 in. (3.17 mm) from case for 10 s max.		←	235		→	°C

ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) = 25°C*

CHARACTERISTIC	SYMBOL	TEST CONDITIONS			LIMITS								UNITS
		VOLTAGE V dc		CURRENT A dc	RCA31		RCA31A		RCA31B		RCA31C		
		V_{CE}	V_{BE}	I_C	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Collector-Cutoff Current:	I_{CEO}	30			–	0.3	–	0.3	–	–	–	–	mA
With base open		60			–	–	–	–	–	0.3	–	0.3	
With base-emitter junction short-circuited	I_{CES}	40	0		–	0.2	–	–	–	–	–	–	
		60	0		–	–	–	0.2	–	–	–	–	
		80	0		–	–	–	–	–	0.2	–	–	
		100	0		–	–	–	–	–	–	–	0.2	
Emitter-Cutoff Current	I_{EBO}		–5	0	–	1	–	1	–	1	–	1	mA
Collector-to-Emitter Sustaining Voltage: With base open	$V_{CEO(sus)}$			0.03[a]	40	–	60	–	80	–	100	–	V
DC Forward-Current Transfer Ratio	h_{FE}	4		1[a]	25	–	25	–	25	–	25	–	
		4		3[a]	10	50	10	50	10	50	10	50	
Base-to-Emitter Voltage	V_{BE}	4		3[a]	–	1.8	–	1.8	–	1.8	–	1.8	V
Collector-to-Emitter Saturation Voltage: I_B = 375 mA				3[a]	–	1.2	–	1.2	–	1.2	–	1.2	V
Common-Emitter Small-Signal, Short-Circuit, Forward Current Transfer Ratio: f = 1 kHz	h_{fe}	10		0.5	20	–	20	–	20	–	20	–	
Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward Current Transfer Ratio: f = 1 MHz	$\|h_{fe}\|$	10		0.5	3	–	3	–	3	–	3	–	
Saturated Switching Time (V_{CC} = 30 V, R_L = 30 Ω, $I_{B1} = I_{B2}$ = 0.1A): Turn-on-time $t_d + t_r$	t_{ON}			1	0.4 (typ.)		0.4 (typ.)		0.4 (typ.)		0.4 (typ.)		μs
Turn-off time $t_s + t_f$	t_{OFF}			1	1.2 (typ.)		1.2 (typ.)		1.2 (typ.)		1.2 (typ.)		
Thermal Resistance: Junction-to-Case	$R_{\theta JC}$				–	3.125	–	3.125	–	3.125	–	3.125	°C/W
Junction-to-Ambient	$R_{\theta JA}$				–	62.5	–	62.5	–	62.5	–	62.5	

[a] Pulsed: Pulse duration = 300 μs, duty factor = 2 %.

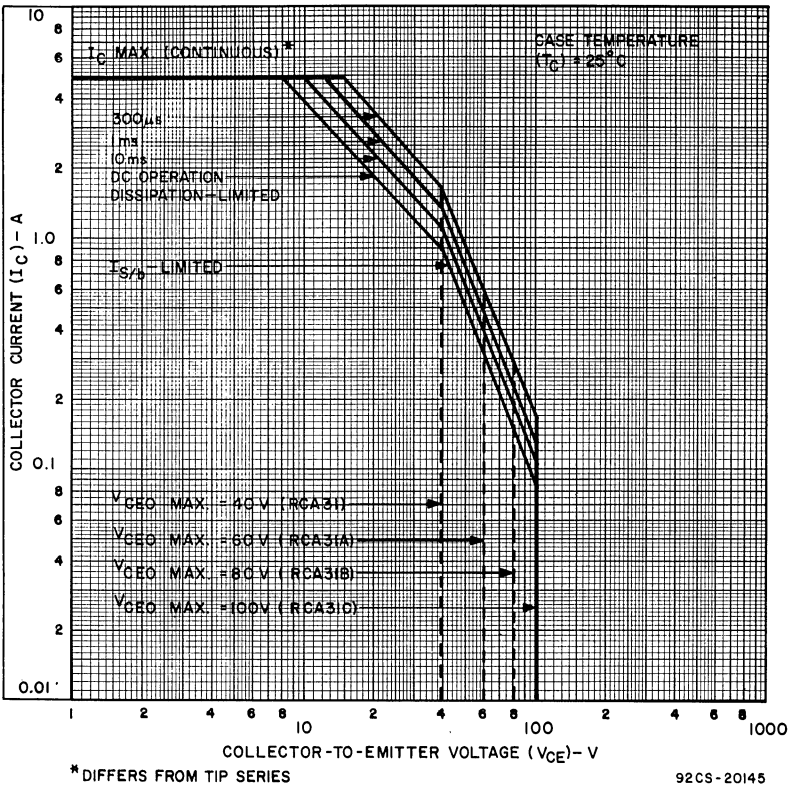


Fig. 1 — Maximum safe operating areas for all types.

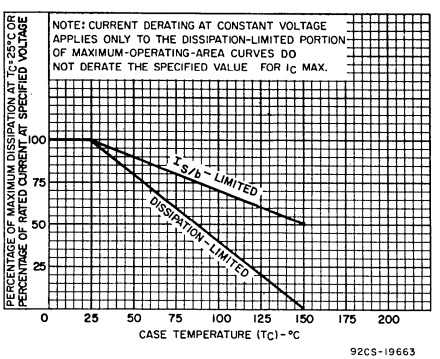


Fig. 2 — Derating curves for all types.

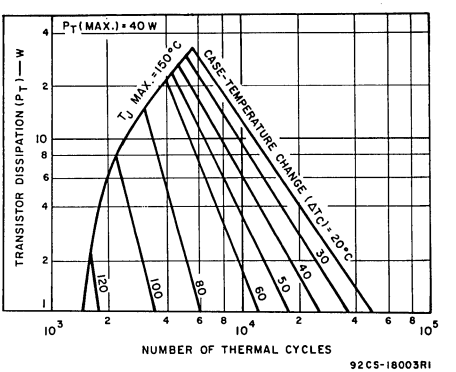


Fig. 3 — Thermal-cycling ratings for all types.

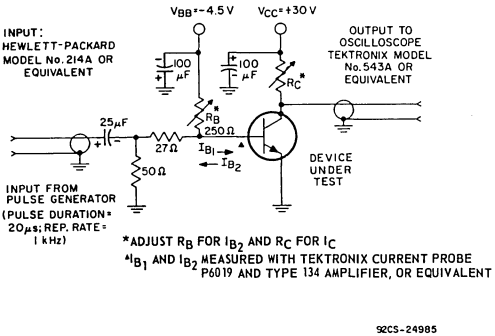


Fig. 4 – Circuit used to measure saturated switching times for all types.

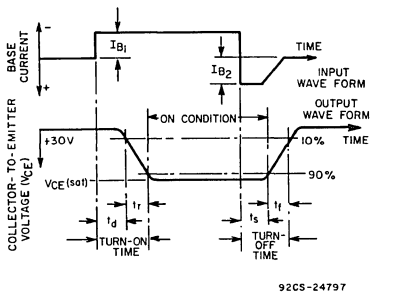


Fig. 5 – Oscilloscope display for measurement of switching times.

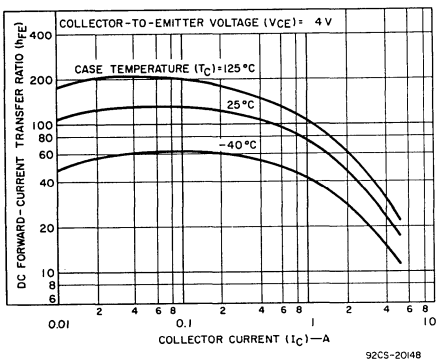


Fig. 6 – Typical dc beta characteristics for RCA31, RCA31A, and RCA31B.

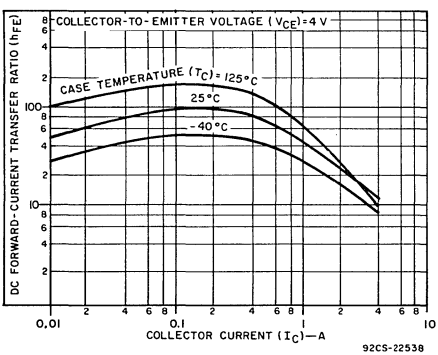


Fig. 7 – Typical dc beta characteristics for RCA31C.

TERMINAL CONNECTIONS

Lead No. 1 – Base
Lead No. 2 – Collector
Lead No. 3 – Emitter
Mounting Flange, Lead No. 4 – Collector