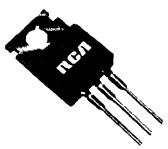
RCA
Solid State
Division

Power Transistors

RCA29/SDH RCA29B/SDH RCA29A/SDH RCA29C/SDH



JEDEC TO-220AB

H-1535

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

For Medium-Power Switching and Amplifier Applications

Features:

- **50 W at 25°C case temperature**
- **Low saturation voltage**
- **Maximum safe-area-of-operation curves**
- **Thermal-cycle rating curves**

TERMINAL CONNECTIONS

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

RCA29/SDH, RCA29A/SDH, RCA29B/SDH, and RCA29C/SDH are single-diffused hometaxial-base silicon n-p-n transistors. These types are essentially hometaxial-base versions of the RCA29, RCA29A, RCA29B, and RCA29C epitaxial-base types, respectively.● 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 differ from each other in voltage ratings and in the currents at which the parameters are controlled.

●RCA29-series types are described in RCA data bulletin File No.583.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		RCA29/SDH	RCA29A/SDH	RCA29B/SDH	RCA29C/SDH	
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	4	4	4	2.5	A
CONTINUOUS BASE CURRENT.	I_B	1	1	1	1	A
*TRANSISTOR DISSIPATION:	P_T					
At case temperatures up to 25°C		36	36	36	50	W
At ambient temperatures up to 25°C		1.8	1.8	1.8	1.8	W
At case temperatures above 25°C		See Fig.2				
At ambient temperatures above 25°C . . . Derate linearly		0.0144				W/°C
TEMPERATURE RANGE:						
Storage & Operating (Junction)		−65 to 150				°C
TERMINAL TEMPERATURE (During Soldering):						
At distance 1/8 in. (3.17 mm) from case for 10 s max.		235				°C

* Differs from RCA29 Series.

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS				UNITS
		DC VOLTAGE (V)			DC CURRENT (A)		RCA29/SDH		RCA29A/SDH		
		V_{CE}	V_{EB}	V_{BE}	I_C	I_B	MIN.	MAX.	MIN.	MAX.	
Collector-Cutoff Current: With base open	I_{CEO}	30				0	–	0.3	–	0.3	mA
With base-emitter junction short-circuited	I_{CES}	40 60		0 0			– –	0.2 –	– –	– 0.2	mA
Emitter Cutoff Current	I_{EBO}		5		0		–	1	–	1	mA
Collector-to-Emitter Breakdown Voltage: With base open	$V_{BR(CEO)}$				0.03[a]	0	40	–	60	–	V
* DC Forward-Current Transfer Ratio	h_{FE}	4 4			0.2[a] 1[a]		40 15	– –	40 15	– –	
Base-to-Emitter Voltage	V_{BE}	4			1[a]		–	1.3	–	1.3	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$				1[a]	0.125	–	0.7	–	0.7	V
Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio (f = 1 kHz)	h_{fe}	10			0.2		20	–	20	–	
* Magnitude of Common Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio (f = 1 MHz)	$\lvert h_{fe} \rvert$	10			0.2		0.8	–	0.8	–	
Unclamped Inductive Load Energy[b] (L=20 mH)See Fig.8		(V_{CC}) 10					–	32	–	32	mJ
* Saturated Switching Time: (R_L = 30 Ω) See Figs. 10 and 11 Turn-on time ($t_d + t_r$)	t_{on}	(V_{CC}) 30			1	0.1[c]	2.3 (typ.)	5	2.3 (typ.)	5	μs
Turn-off time ($t_s + t_f$)	t_{off}	(V_{CC}) 30			1	0.1[c]	6 (typ.)	15	6 (typ.)	15	μs
* Thermal Resistance: Junction-to-Case	$R\theta_{JC}$						–	3.5	–	3.5	°C/W
Junction-to-Ambient	$R\theta_{JA}$						–	70	–	70	°C/W

* Differs from RCA29 Series.

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

[b] Based upon ability of device to perform in circuit shown in Fig.8.

[c] $I_{B_1} = I_{B_2}$ = value shown.

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS				UNITS
		DC VOLTAGE (V)			DC CURRENT (A)		RCA29B/SDH		RCA29C/SDH		
		V_{CE}	V_{EB}	V_{BE}	I_C	I_B	MIN.	MAX.	MIN.	MAX.	
Collector-Cutoff Current: With base open	I_{CEO}	60				0	–	0.3	–	0.3	mA
With base-emitter junction short-circuited	I_{CES}	80 100		0 0			– –	0.2 –	– –	– 0.2	
Emitter Cutoff Current	I_{EBO}		5		0		–	1	–	1	mA
Collector-to-Emitter Breakdown Voltage: With base open	$V_{BR(CEO)}$				0.03[a]	0	80	–	100	–	V
* DC Forward-Current Transfer Ratio	h_{FE}	4 4			0.2[a] 1[a]		40 15	– –	40 15	– –	
Base-to-Emitter Voltage	V_{BE}	4			1[a]		–	1.3	–	1.3	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$				1[a]	0.125	–	0.7	–	0.7	V
Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio (f = 1 kHz)	h_{fe}	10			0.2		20	–	20	–	
* Magnitude of Common Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio (f = 1 MHz)	$\lvert h_{fe} \rvert$	10			0.2		0.8	–	0.8	–	
Unclamped Inductive Load Energy[b] (L=20 mH)See Fig.8		(V_{CC}) 10					–	32	–	32	mJ
* Saturated Switching Time: (R_L = 30 Ω) See Figs. 10 and 11 Turn-on time ($t_d + t_r$)	t_{on}	(V_{CC}) 30			1	0.1[c]	2.3 (typ.)	5	2.3 (typ.)	5	μs
Turn-off time ($t_s + t_f$)	t_{off}	(V_{CC}) 30			1	0.1[c]	6 (typ.)	15	6 (typ.)	15	
* Thermal Resistance: Junction-to-Case	$R\theta_{JC}$						–	3.5	–	2.5	°C/W
Junction-to-Ambient	$R\theta_{JA}$						–	70	–	70	

* Differs from RCA29 Family.

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

[b] Based upon ability of device to perform in circuit shown in Fig.8.

[c] $I_{B_1} = I_{B_2}$ = value shown.

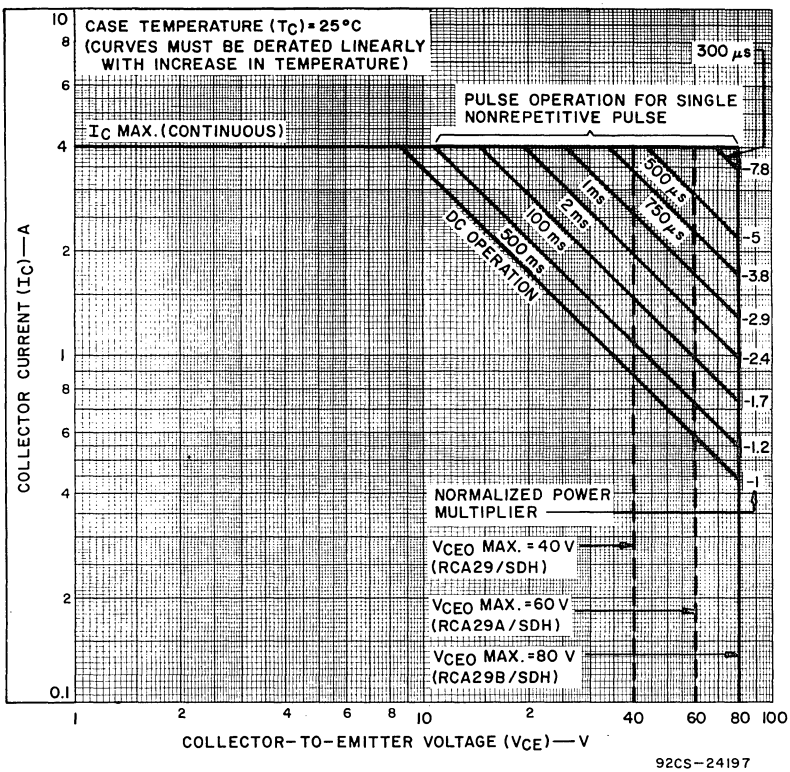


Fig.1 – Maximum operating areas for RCA29/SDH, RCA29A/SDH, and RCA29B/SDH.

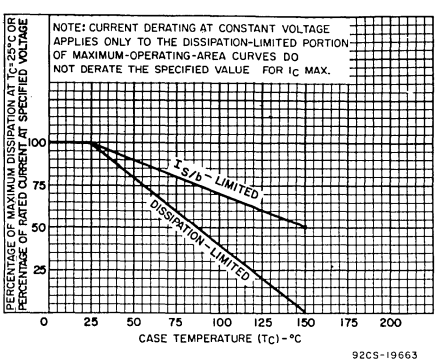


Fig.2 – Dissipation and $I_{S/b}$ derating curves for all types.

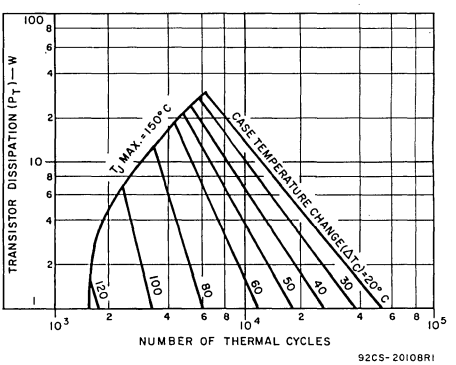


Fig.3 – Thermal-cycling rating chart for RCA29/SDH, RCA29A/SDH, and RCA29B/SDH.

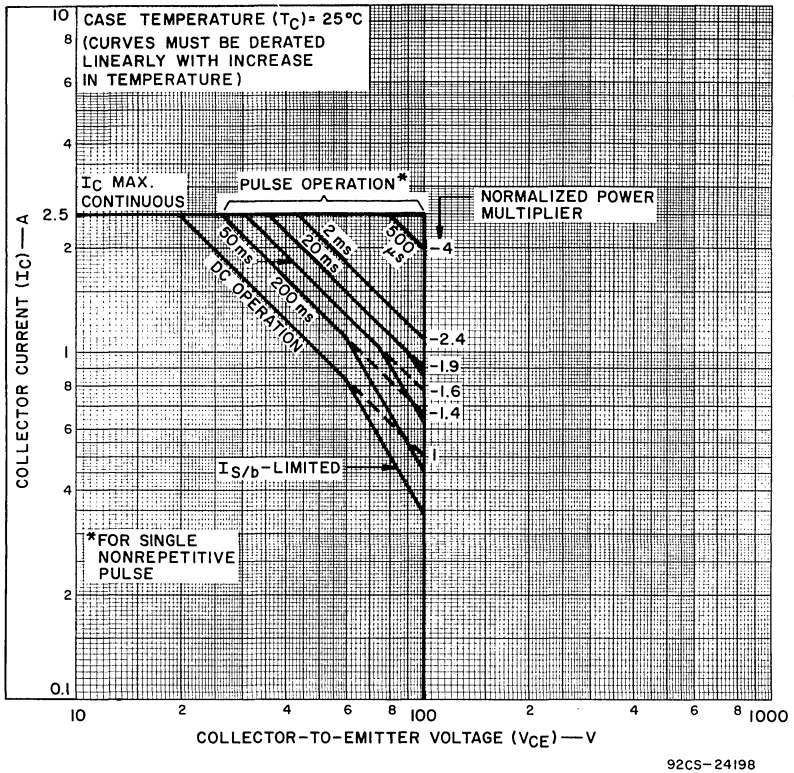


Fig.4 — Maximum operating areas for RCA29C/SDH.

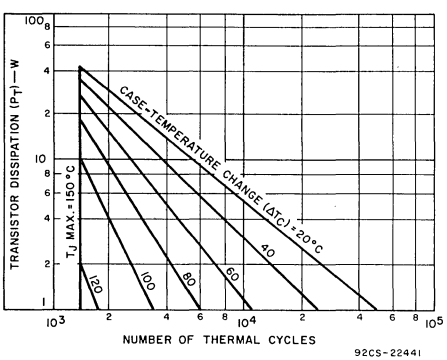


Fig.5 — Thermal-cycling rating chart for RCA29C/SDH.

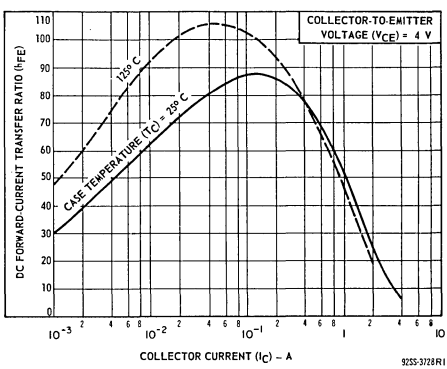


Fig.6 — Typical dc beta characteristics for RCA29/SDH, RCA29A/SDH, and RCA29B/SDH.

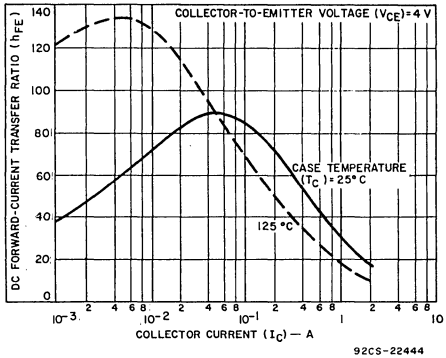


Fig.7 — Typical dc beta characteristics for RCA29C/SDH.

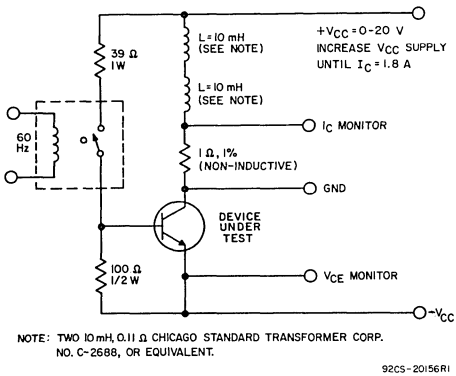


Fig.8 — Circuit for measuring inductive-load switching for all types.

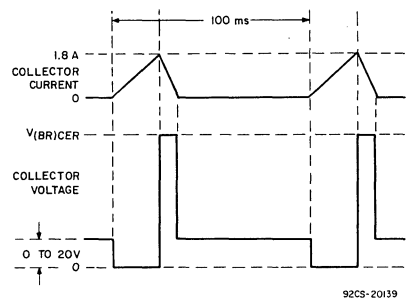


Fig. 9 — Inductive-load switching voltage and current waveforms (test circuit shown in Fig.8).

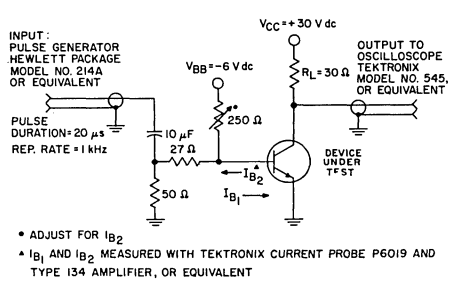


Fig.10 — Circuit used to measure switching times for all types.

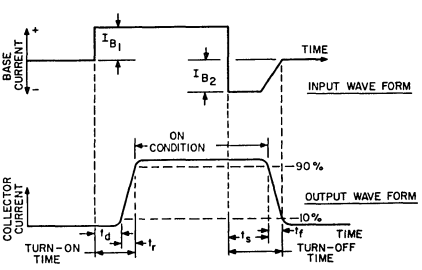


Fig.11 — Phase relationship between input current and output voltage showing reference points for specification of switching times (test circuit shown in Fig.10).