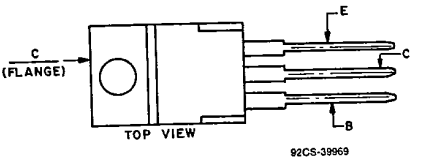
High-Current, Silicon N-P-N VERSAWATT Transistors

Switching Applications

Features:
- *Fast switching speed at temperatures up to 125° C*
- *Low $V_{CE}(sat)$*
- *VERSAWATT plastic package*

TERMINAL DESIGNATIONS



JEDEC TO-220AB

RCA-2N6702, 2N6703, and 2N6704* epitaxial-base silicon n-p-n power transistors which feature fast switching speeds, low saturation voltages, and high safe-operating-area (SOA) ratings. They are specially designed for converters, inverters, pulse-width-modulated regulators and a variety of power switching circuits.

The 2N6702, 2N6703, and 2N6704 transistors are supplied in the JEDEC TO-220AB (RCA VERSAWATT) plastic packages.

*Formerly RCA Dev. Type Nos. TA9164A, TA9164B, TA9164C, respectively.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

	2N6702	2N6703	2N6704	
* V_{CEV}				
V_{BE} = −1.5 V	140	160	180	V
* V_{CEO}	90	110	130	V
* V_{EBO}		7		V
$I_C(sat)$	5	5	4	A
* I_C		7		A
I_{CM}		10		A
* I_B		5		A
* P_T				
T_C up to 25° C		50		W
T_C above 25° C ..... Derate Linearly		0.4		W/°C
* T_{stg}, T_J		−65 to 150		°C
* T_L				
At distance ≥ 1/8 in. (3.16 mm) from seating plane for 10 s max.		235		°C

*In accordance with JEDEC registration data.

ELECTRICAL CHARACTERISTICS, at Case Temperature T_C = 25°C Unless Otherwise Specified

	CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
		VOLTAGE V dc		CURRENT A dc		2N6702		2N6703		2N6704		
		V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	Min.	Max.	
*	I_{CEV}	140	−1.5			–	100	–	–	–	–	μA
		160	−1.5			–	–	–	100	–	–	
		180	−1.5			–	–	–	–	–	100	
	T_C = 125°C	140	−1.5			–	1	–	–	–	–	mA
		160	−1.5			–	–	–	1	–	–	
		180	−1.5			–	–	–	–	–	1	
*	I_{EBO}		−7	0		–	100	–	100	–	100	μA
*	$V_{CEO(sus)}$[b]			0.01[a]	0	90	–	110	–	130	–	V
*	h_{FE}	2		0.2[a]		30	–	30	–	30	–	
		2		4[a]		–	–	–	–	20	–	
		2		5[a]		20	–	20	–	–	–	
*	$V_{BE(sat)}$			4[a]	0.4	–	–	–	–	–	1.4	V
				5[a]	0.5	–	1.5	–	1.5	–	–	
*	$V_{CE(sat)}$			4[a]	0.4	–	–	–	–	–	0.7	
				5[a]	0.5	–	0.8	–	0.8	–	–	
				7[a]	0.7	–	1.5	–	1.5	–	1.5	
	$I_{S/b}$	20		2.5		1	–	1	–	1	–	s
*	$\lvert h_{fe} \rvert$ f = 5 MHz	10		0.5		10	40	10	40	10	40	
	f_T	10		0.5		50	200	50	200	50	200	MHz
*	C_{obo} f = 0.1 MHz	10[c]				50	150	50	150	50	150	pF
*	t_d[d]		−4	4	0.4	–	–	–	–	–	0.1	μs
				5	0.5	–	0.1	–	0.1	–	–	
*	t_r[d]		−4	4	0.4	–	–	–	–	–	0.25	
				5	0.5	–	0.25	–	0.25	–	–	
*	t_s[d]		−4	4	0.4[e]	–	–	–	–	–	1	
				5	0.5[e]	–	1	–	1	–	–	
*	t_f[d]		−4	4	0.4[e]	–	–	–	–	–	0.5	
				5	0.5[e]	–	0.5	–	0.5	–	–	
*	$R_{\theta JC}$	4		5		–	2.5	–	2.5	–	2.5	°C/W

* In accordance with JEDEC registration data.

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

[b] **CAUTION:** The sustaining voltage $V_{CEO(sus)}$ *MUST NOT* be measured on a curve tracer.

[c] V_{CB} value.

[d] V_{CC} = 70 V, t_p = 20 μs

[e] $I_{B_1} = -I_{B_2}$.

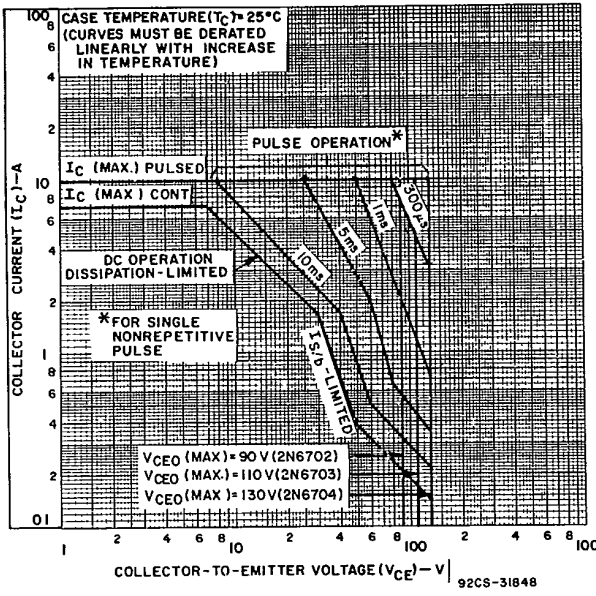


Fig. 1 – Maximum operating areas for all types (T_C = 25°C).

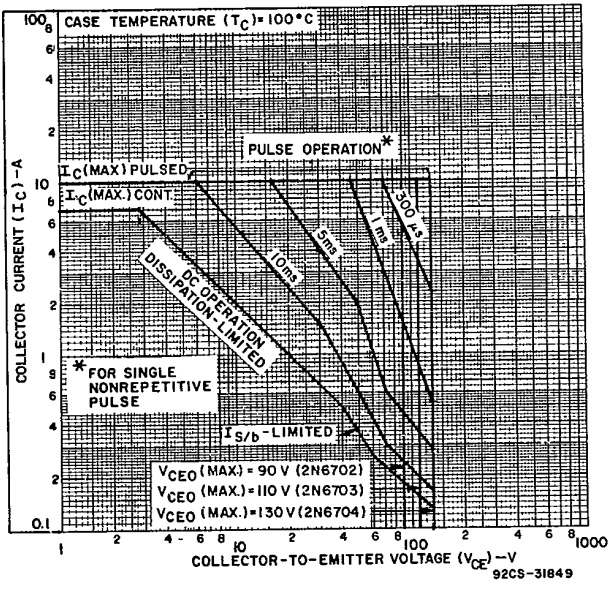


Fig. 2 – Maximum operating areas for all types (T_C = 100°C).

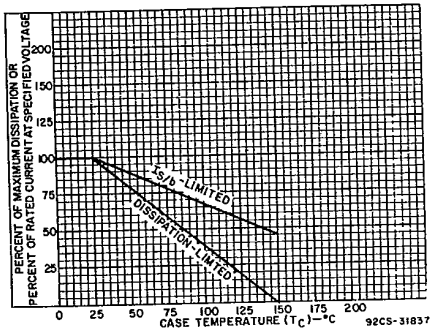


Fig. 3 — Dissipation and $I_{S/b}$ derating curves for all types.

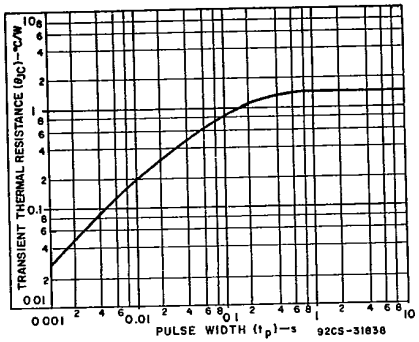


Fig. 4 — Typical thermal-response characteristic for all types.

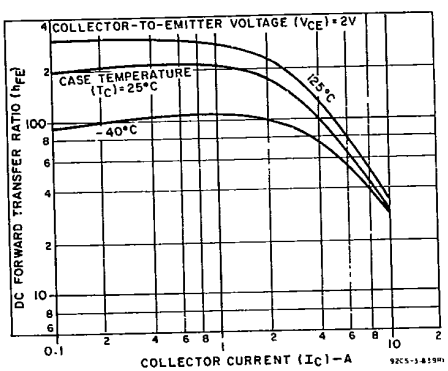


Fig. 5 — Typical dc beta characteristics for all types.

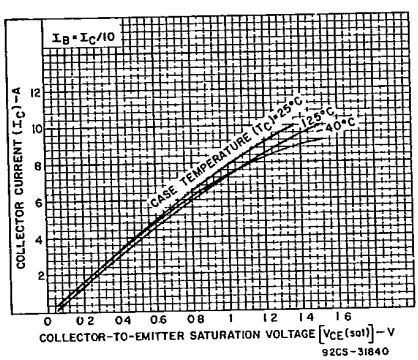


Fig. 6 — Typical collector-to-emitter saturation voltage characteristics for all types.

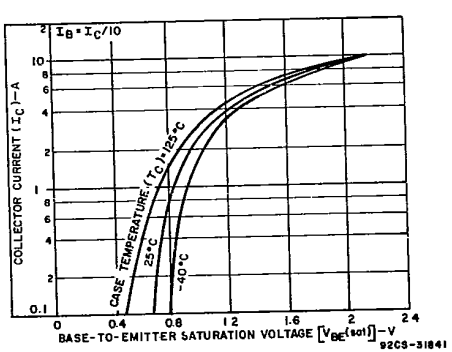


Fig. 7 — Typical base-to-emitter saturation voltage characteristic for all types.

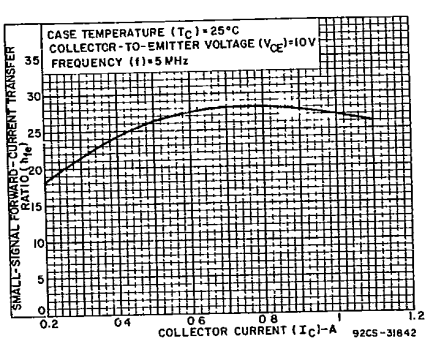


Fig. 8 — Typical small-signal forward-current transfer ratio characteristic for all types (f = 5 MHz).

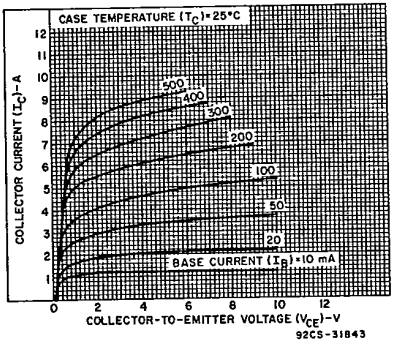


Fig. 9 – Typical output characteristics for all types.

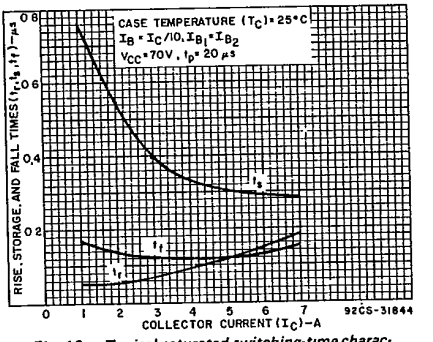


Fig. 10 – Typical saturated-switching-time characteristics as a function of collector current for all types (T_C = 25°C).

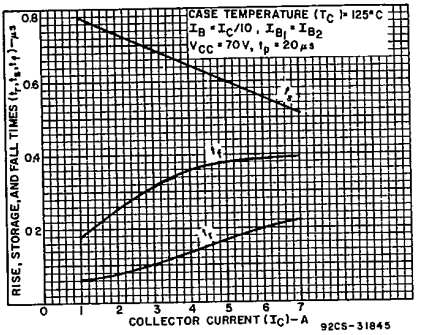


Fig. 11 – Typical saturated-switching-time characteristics as a function of collector current for all types (T_C = 125°C).

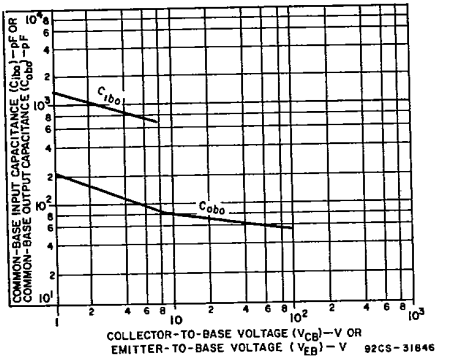


Fig. 12 – Typical common-base input (C_{ibo}) or output (C_{obo}) capacitance characteristic for all types.

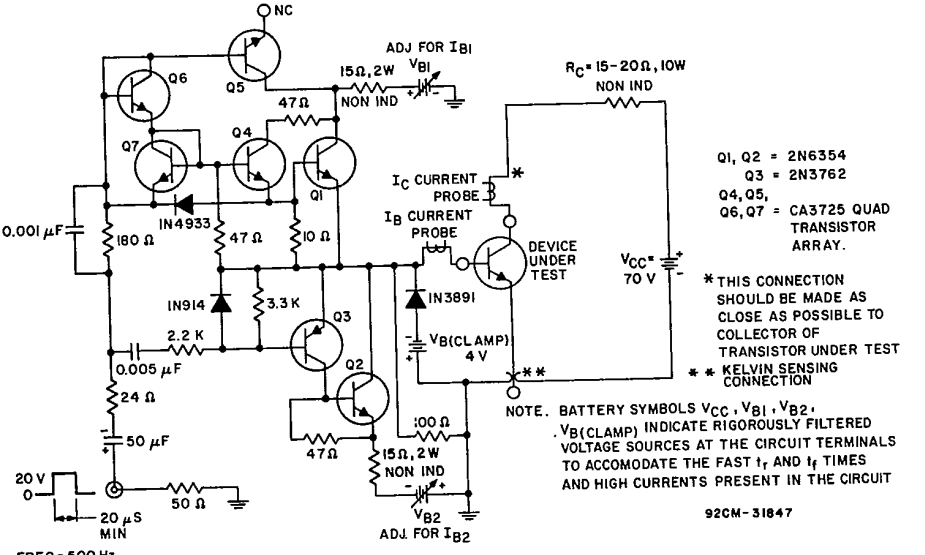
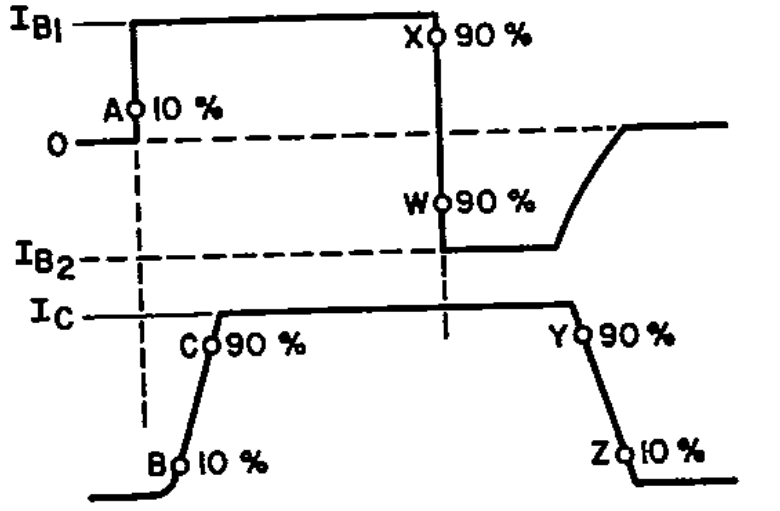


Fig. 13 – Circuit for measuring switching times.



t_d = A–B t_s = X–Y
t_r = B–C t_f = Y–Z
$t_{transition}$ = X–W
NOTE: TRANSITION TIME FROM 90% I_{B_1} TO 90% I_{B_2} MUST BE LESS THAN 0.5 μs.

Fig. 14 — Phase relationship between input and output currents showing reference points for specification of switching times.