15-A, 75-W, Silicon N-P-N and P-N-P Epitaxial-Base VERSAWATT Transistors

Complementary Pairs for General-Purpose Switching and Amplifier Applications

Features:

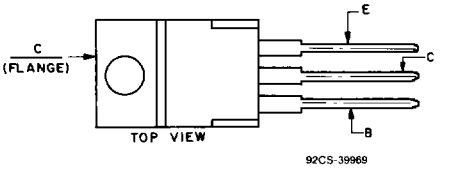
- *Maximum safe-area-of-operation curves*

RCA-2N6486—2N6491•, inclusive, are epitaxial-base silicon transistors. The 2N6486, 2N6487, and 2N6488 are n-p-n complements of p-n-p types 2N6489, 2N6490, and 2N6491, respectively. All these devices are intended for a wide variety of medium-power switching and amplifier applications, and are particularly useful in high-fidelity amplifiers utilizing complementary-symmetry circuits.

These devices are supplied in the TO-220AB (VERSAWATT) plastic package.

• Formerly RCA Dev. Nos. TA8325, TA8324, TA8323, TA8328, TA8327, and TA8326, respectively.

TERMINAL DESIGNATIONS



JEDEC TO-220AB

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		N-P-N	2N6486	2N6487	2N6488	
		P-N-P	2N6489†	2N6490†	2N6491†	
*COLLECTOR-TO-BASE VOLTAGE	V_{CBO}		50	70	90	V
COLLECTOR-TO-EMITTER VOLTAGE:						
* With 1.5 volts (V_{BE}) of reverse bias, and external base-to-emitter resistance (R_{BE}) = 100 Ω	V_{CEX}		50	70	90	V
With external base-to-emitter resistance (RBE) = 100 Ω	V_{CER}		45	65	85	V
With base open	V_{CEO}		40	60	80	V
*EMITTER-TO-BASE VOLTAGE	V_{EBO}		5	5	5	V
*CONTINUOUS COLLECTOR CURRENT	I_C		15	15	15	A
*CONTINUOUS BASE CURRENT	I_B		5	5	5	A
*TRANSISTOR DISSIPATION:	P_T					
At case temperatures up to 25°C			57	75	75	W
At ambient temperatures up to 25°C			1.8	1.8	1.8	W
At case temperatures above 25°C				Derate linearly 0.6		W/°C
At ambient temperatures above 25°C				Derate linearly 0.0144		W/°C
*TEMPERATURE RANGE:						
Storage and operating (Junction)			-65 to +150			°C
*LEAD TEMPERATURE (During soldering):						
At distance ≥ 1/8 in. (3.17 mm) from seating plane for 10 s max			235			°C

* In accordance with JEDEC registration data format JS-6 RDF-2.

† For p-n-p devices, voltage and current values are negative.

ELECTRICAL CHARACTERISTICS, *At case temperature (T_C) = 25°C unless otherwise specified*

	CHARACTERISTIC	SYMBOL	TEST CONDITIONS			LIMITS						UNITS
			VOLTAGE V dc		CURR. A dc	2N6486 2N6489♦		2N6487 2N6490♦		2N6488 2N6491♦		
			V_{CE}	V_{BE}	I_C	Min.	Max.	Min.	Max.	Min.	Max.	
	Collector-Cutoff Current: With external base-emitter resistance (R_{BE}) = 100Ω	I_{CER}	35 55 75			– – –	500 – –	– – –	– 500 –	– – –	– – 500	μA
*	With base-emitter junction reverse biased and external base-to-emitter resistance (R_{BE}) = 100Ω	I_{CEX}	45 65 85	–1.5 –1.5 –1.5		– – –	500 – –	– – –	– 500 –	– – –	– – 500	μA
*	At T_C = 150°C		40 60 80	–1.5 –1.5 –1.5		– – –	5 – –	– – –	– 5 –	– – –	– – 5	mA
*	With base open	I_{CEO}	20 30 40			– – –	1 – –	– – –	– 1 –	– – –	– – 1	mA
*	Emitter-Cutoff Current	I_{EBO}		–5	0	–	1	–	1	–	1	mA
*	DC Forward-Current Transfer Ratio	h_{FE}	4 4		5[a] 15[a]	20 5	150 –	20 5	150 –	20 5	150 –	
*	Collector-to-Emitter Sustaining Voltage With base open	$V_{CEO(sus)}$			0.2	40[b]	–	60[b]	–	80[b]	–	V
	With external base-emitter resistance (R_{BE}) = 100Ω	$V_{CER(sus)}$			0.2	45[b]	–	65[b]	–	85[b]	–	
	With base-emitter junction reverse-biased and external base-to-emitter resistance (R_{BE}) = 100Ω	$V_{CEX(sus)}$		–1.5	0.2	50[b]	–	70[b]	–	90[b]	–	
*	Base-to-Emitter Voltage	V_{BE}	4 4		5[a] 15[a]	– –	1.3 3.5	– –	1.3 3.5	– –	1.3 3.5	V
*	Collector-to-Emitter Saturation Voltage: I_B = 0.5 A; I_B = 5 A	$V_{CE(sat)}$			5[a] 15[a]	– –	1.3 3.5	– –	1.3 3.5	– –	1.3 3.5	V
*	Magnitude of Common-Emitter Small-Signal Short-Circuit Forward-Current Transfer Ratio: f = 1 MHz	$\lvert h_{fe} \rvert$	4		1	5	–	5	–	5	–	
*	Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio (f = 1 kHz)	h_{fe}	4		1	25	–	25	–	25	–	
	Thermal Resistance: Junction-to-case	$R_{\theta JC}$				–	1.67	–	1.67	–	1.67	°C/W
	Junction-to-ambient	$R_{\theta JA}$				–		–	70	–	70	

* In accordance with JEDEC registration data format (JS-6 RDF-2).

[a] Pulsed; pulse duration = 300 μs, duty factor = 1.8%.

[b] *CAUTION: Sustaining voltages $V_{CEO(sus)}$, $V_{CER(sus)}$, and $V_{CEX(sus)}$ MUST NOT be measured on a curve tracer.*

♦ For p-n-p devices, voltage and current values are negative.

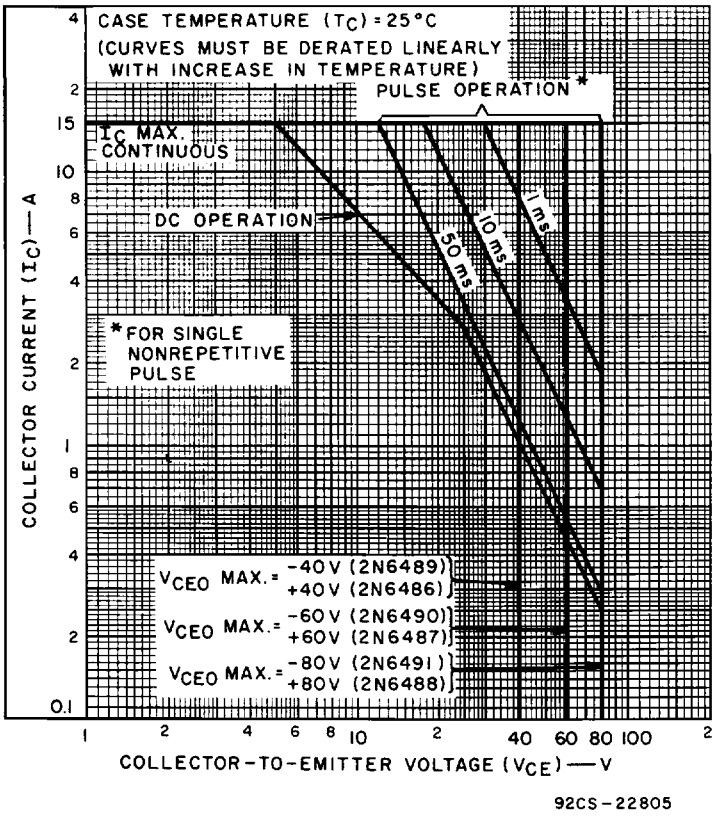


Fig. 1 — Maximum operating areas for all types†.

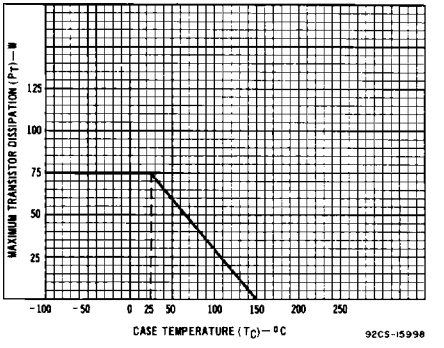


Fig. 2 — Derating chart for all types

† For p-n-p devices, voltage and current values are negative.

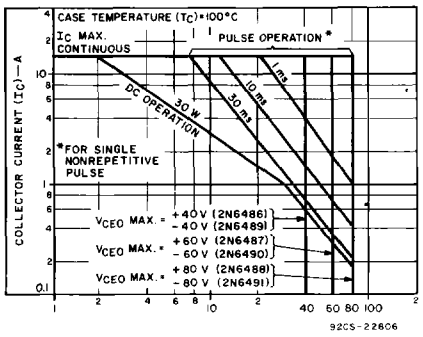


Fig. 3 — Maximum operating areas for all types†.

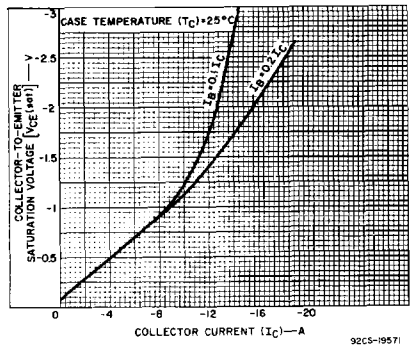


Fig. 4 — Typical collector-to-emitter saturation-voltage characteristics for all types.

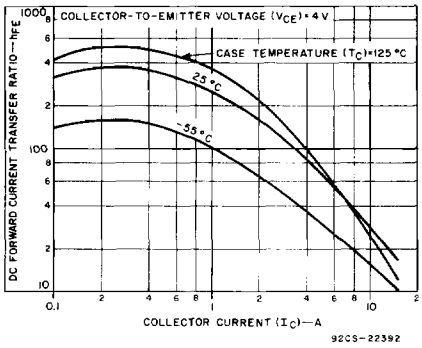


Fig. 5 — Typical dc beta characteristics for 2N6486, 2N6487, and 2N6488.

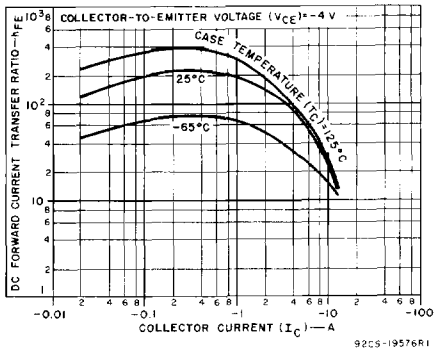


Fig. 6 — Typical dc beta characteristics for 2N6489, 2N6490, and 2N6491.

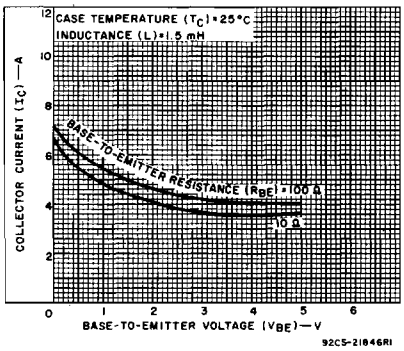


Fig. 7 — Minimum reverse-bias second-breakdown characteristics for all types†.

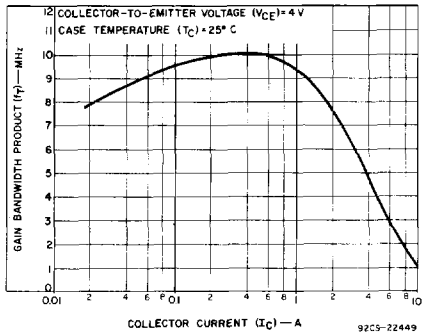


Fig. 8 — Typical gain-bandwidth product vs. collector current for all types†.

† For p-n-p devices, voltage and current values are negative.

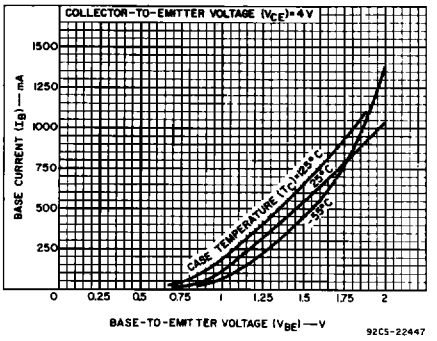


Fig. 9 — Typical input characteristics for all types†.

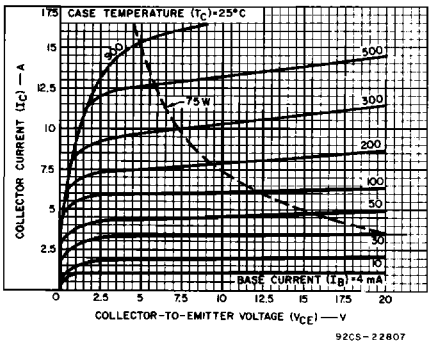


Fig. 10 — Typical output characteristics for all types†.

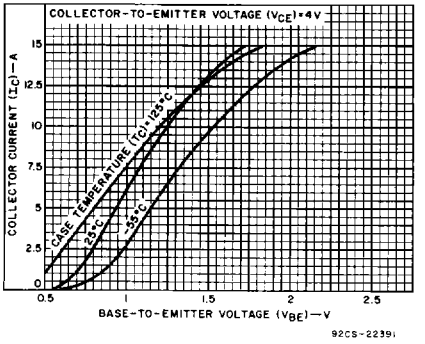


Fig. 11 — Typical transfer characteristics for all types†.

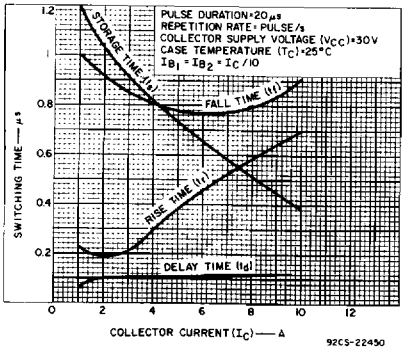


Fig. 12 — Typical saturated switching characteristics for 2N6486, 2N6487, and 2N6488.

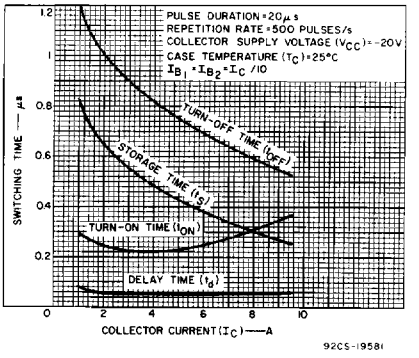


Fig. 13 — Typical saturated switching characteristics for 2N6489, 2N6490, and 2N6491.

† For p-n-p devices, voltage and current values are negative.

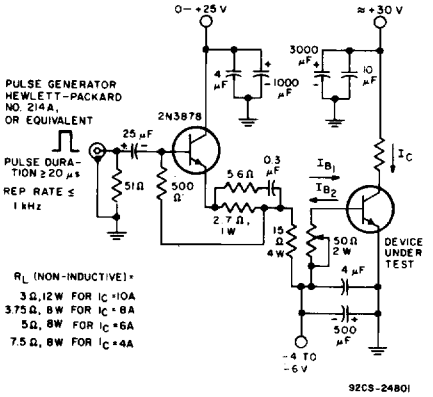


Fig. 14 — Circuit used to measure switching times for 2N6486, 2N6487, and 2N6488.

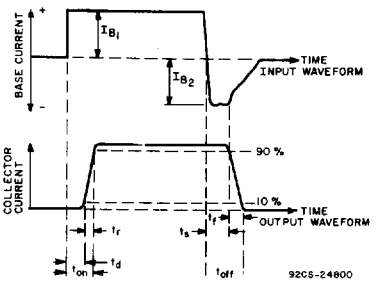


Fig. 15 — Phase relationship between input and output currents showing reference points for specification of switching times (test circuit shown in Fig. 14).

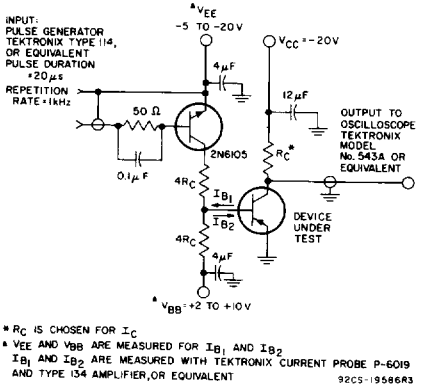


Fig. 16 — Circuit used to measure switching times for 2N6489, 2N6490, and 2N6491.

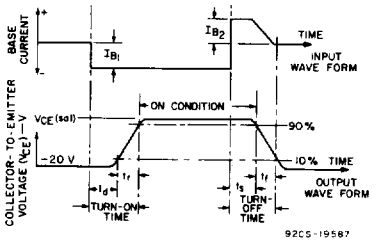


Fig. 17 — Oscilloscope display for measurement for switching times (test circuit shown in Fig. 16).

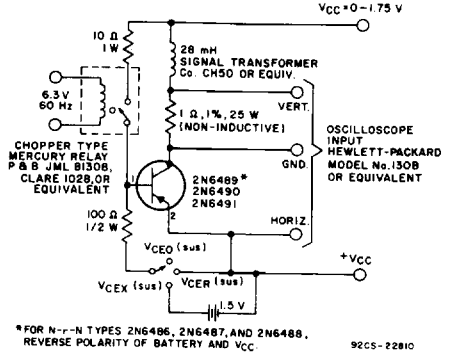


Fig. 18 — Circuit used to measure sustaining voltages $V_{CEO}(sus)$, $V_{CER}(sus)$, and $V_{CEX}(sus)$ for all types.

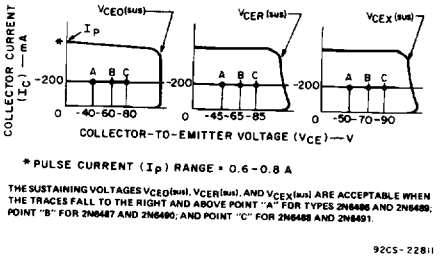


Fig. 19 — Oscilloscope display for measurement of sustaining voltages (test circuit shown in Fig. 18).