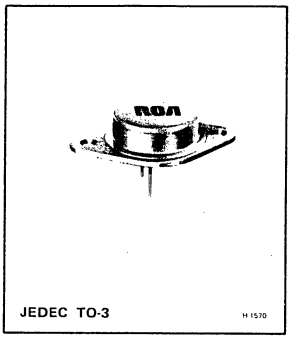
RCA
Solid State
Division

Power Transistors

2N5804
2N5805



High-Voltage, High-Power Silicon N-P-N Power Transistors

For Switching and Amplifier Applications

Features:

- **Power dissipation (P_T) = 110 W at 50 V**
- **High-voltage ratings:**
  V_{CEO}(sus) = 300 V max. (2N5805)
  = 225 V max. (2N5804)
- **Maximum-operating-area curves. . .for selection of maximum operating conditions for operation free from second breakdown.**

RCA types 2N5804 and 2N5805** are silicon n-p-n transistors with high breakdown-voltage ratings and fast switching speeds. Both devices employ the popular TO-3 package; they differ in breakdown-voltage ratings and leakage-current values.
These transistors are especially suitable for power-switching circuits, switching regulators, converters, inverters, and power amplifiers.

**Formerly RCA Dev. Nos. TA7130 and TA7130A, respectively.

TERMINAL CONNECTIONS

Pin 1 — Base
Pin 2 — Emitter
Case — Collector
Mounting Flange — Collector

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		2N5804	2N5805	
*COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	300	375	V
COLLECTOR-TO-EMITTER SUSTAINING VOLTAGE:				
* With 1.5 volts (V_{BE}) of reverse bias, and external base-to-emitter resistance (R_{BE}) = 50Ω	V_{CEX}(sus)	300	375	V
With base open	V_{CEO}(sus)	225	300	V
*EMITTER-TO-BASE VOLTAGE	V_{EBO}	6	6	V
*CONTINUOUS COLLECTOR CURRENT	I_C	5	5	A
PEAK COLLECTOR CURRENT	I_{CM}	15	15	A
*CONTINUOUS BASE CURRENT	I_B	2	2	A
*TRANSISTOR DISSIPATION:	P_T			
At case temperatures up to 25° C and V_{CE} up to 50 V		110	110	W
At case temperatures up to 25° C and V_{CE} above 50 V		See Fig. 1		
At case temperatures above 25° C and V_{CE} above 50 V		See Figs. 1 & 3		
*TEMPERATURE RANGE:				
Storage & Operating (Junction)		—— -65 to +200 ——		°C
*PIN TEMPERATURE (During Soldering):				
At distances ≥ 1/32 in. (0.8 mm) from seating plane for 10 s max		——— +230 ———		°C

*In accordance with JEDEC registration data format (JS-6 RDF-1)

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS				LIMITS				UNITS
		VOLTAGE V dc		CURRENT A dc		2N5804		2N5805		
		V_{CE}	V_{BE}	I_C	I_B	MIN.	MAX.	MIN.	MAX.	
Collector-Cutoff Current: With base open	I_{CEO}	150			0	–	15	–	5	mA
* With base-emitter junction reverse biased	I_{CEV}	270	−1.5			–	5	–	–	mA
		340	−1.5			–	–	–	5	
At T_C = 100°C		270	−1.5			–	15	–	–	mA
		340	−1.5			–	–	–	15	
* Emitter-Cutoff Current	I_{EBO}		−6	0		–	30	–	30	mA
			−5	0		–	5		5	
DC Forward-Current	h_{FE}	10		0.5[a]		25	250	25	250	
* Transfer Ratio		4		5[a]		10	100	10	100	
* Collector-to-Emitter Sustaining Voltage: (See Fig. 5, 6, and 7) With base open	$V_{CEO(sus)}$			0.2	0	225[b]	–	300[b]	–	V
* With external base-to-emitter resistance (R_{BE}) = 50 Ω	$V_{CEX(sus)}$		−1.5	0.2[c]	0	300[b]	–	375[b]	–	V
Emitter-to-Base Voltage	V_{EBO}				0.03	6	–	6	–	V
* Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$			5[a]	0.5	–	2	–	2	V
* Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$			5[a]	0.5	–	2	–	2	V
Output Capacitance V_{CB} = 10 V, f = 1 MHz	C_{obo}					–	450	–	450	pF
* Forward-Bias, Second-Breakdown Collector Current: t = 1 s, nonrepetitive	$I_{S/b}$	50				2.2	–	2.2	–	A
Second-Breakdown Energy With base reverse biased R_B = 20 Ω, L = 50 μH	$E_{S/b}$		−4	5		0.62	–	0.62	–	mJ
* Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio f = 5 MHz	h_{fe}	10		1		3	–	3	–	
Saturated Switching Time (V_{CC} = 200 V): Turn-On (Delay Time + Rise Time)	t_{ON}			5	0.5	–	0.5	–	0.5	μs
Storage (See Figs. 12, 13 and 14)	t_s			5	0.5	–	3.5	–	3.5	μs
Fall (See Figs. 12, 13 and 16)	t_f			5	0.5	–	2.0	–	2.0	μs
** Thermal Resistance: (Junction-to-Case)	$R_{\theta JC}$	10		5		–	1.6	–	1.6	°C/W

[a]Pulsed; pulse duration ≤ 350 μs, duty factor = 2%

[b]CAUTION: The sustaining voltages V_{CEO}(sus) and V_{CEX}(sus) MUST NOT be measured on a curve tracer. These sustaining voltages should be measured by means of the test circuit shown in Fig. 6.

[c]Pulsed: pulse duration = 8.33 ms; duty factor = 50%

*In accordance with JEDEC registration data format (JS-6 RDF-1).

**Specified in JEDEC registration data as a derating factor of 0.625 W/°C.

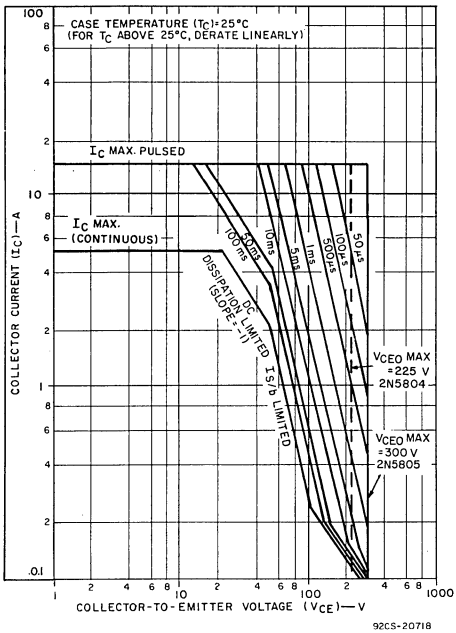


Fig. 1—Maximum operating areas for both types.

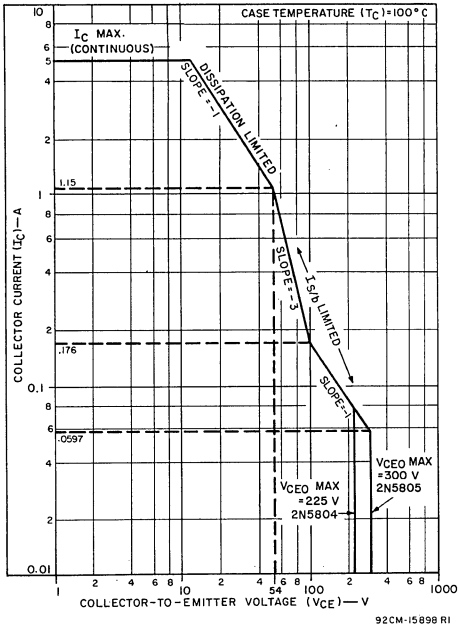


Fig. 2—Maximum operating areas for both types.

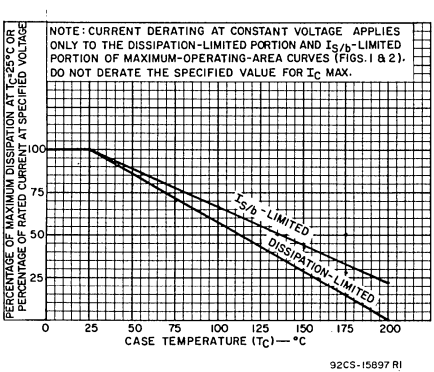


Fig. 3—Derating curves for both types.

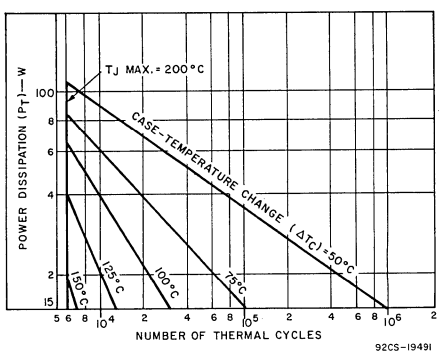


Fig. 4—Thermal-cycling rating chart.

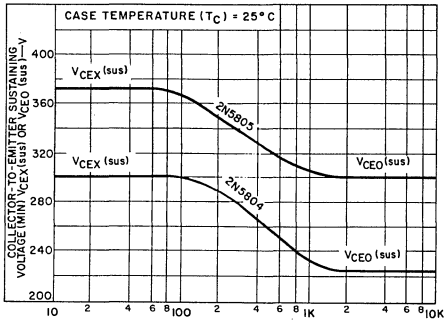


Fig. 5—Collector-to-emitter sustaining voltage characteristics.

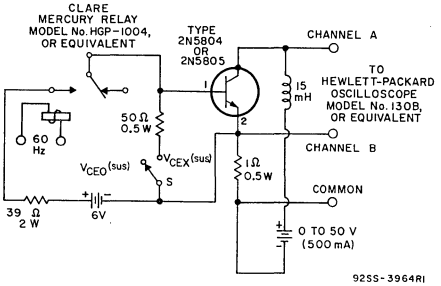


Fig. 6—Circuit used to measure sustaining voltages $V_{CEO(sus)}$ and $V_{CEX(sus)}$.

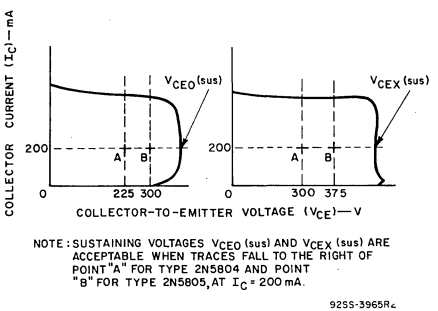


Fig. 7—Oscilloscope display for measurement of sustaining voltages (test circuit shown in Fig. 6).

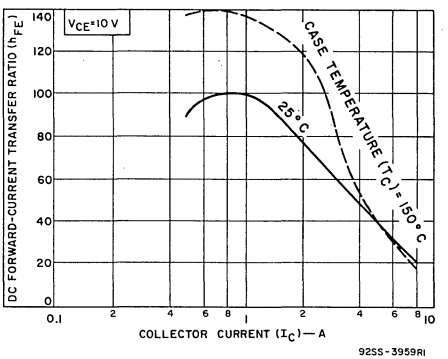


Fig. 8—Typical dc beta characteristics.

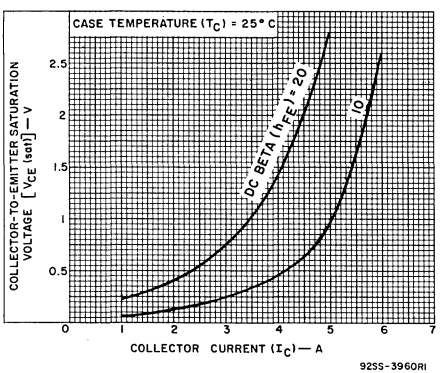


Fig. 9—Typical saturation-voltage characteristics.

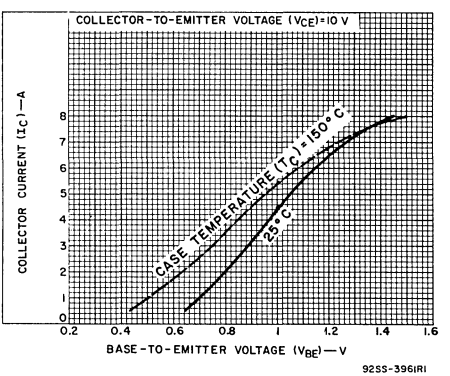


Fig. 10—Typical transfer characteristics.

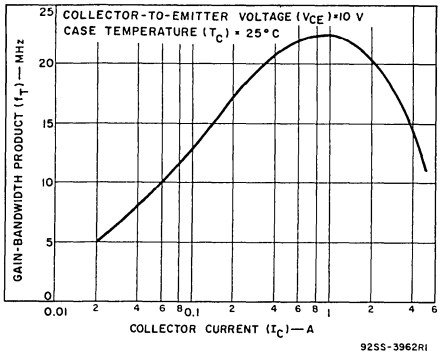


Fig. 11—Typical gain-bandwidth product.

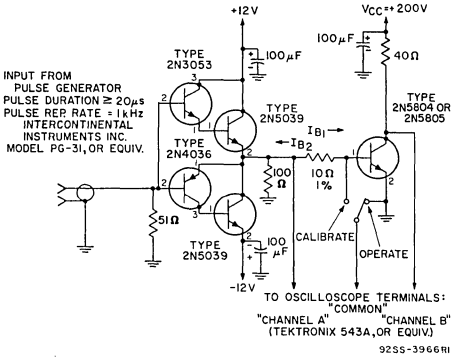


Fig. 12—Circuit used to measure switching times.

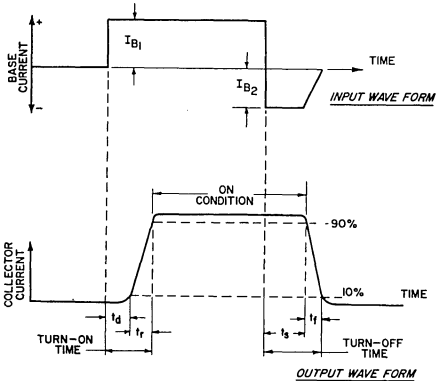


Fig. 13—Phase relationship between input and output currents showing reference points for specification of switching times (test circuit shown in Fig. 12).

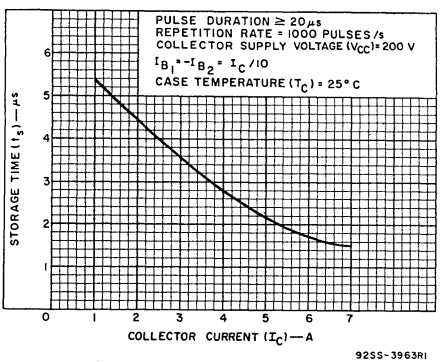


Fig. 14—Typical storage-time characteristic.

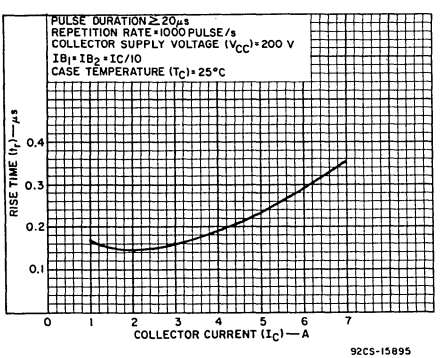


Fig. 15—Typical rise-time characteristic.

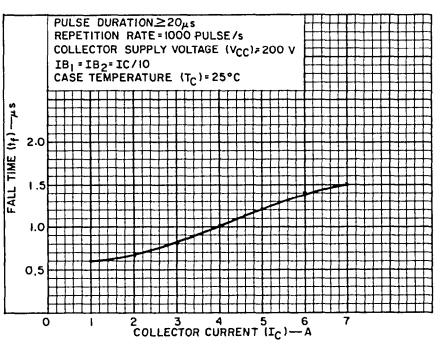


Fig. 16—Typical fall-time characteristic.