RCA
Solid State
Division

Power Transistors

2N5575 2N5578

Modified JEDEC TO-3
(0.060-In.-Dia. Pins)

H-1811

High-Current, High-Power, Hometaxial-Base Silicon N-P-N Transistors

For Linear and Switching Applications in Military, Commercial, and Industrial Equipment

Features:

- Maximum safe-area-of operation curves
- $I_{S/b}$-limit line beginning at 25 V
- High-current capability
- Low saturation voltage at high beta
- High-dissipation capability
- Low thermal resistance

RCA-2N5575 and 2N5578° are high-current, high-power, hometaxial-base silicon n-p-n transistors. They differ in maximum voltage and current ratings.

These power transistors are intended for a wide variety of high-current, high-power linear and switching applications such as low- to medium-frequency amplifiers, switching and linear regulators, power-switching circuits, series- or shunt-regulator driver and output stages, dc-to-dc converters, inverters, control circuits, and solenoid (hammer)/relay drivers.

The high-current capability (100-A peak) makes these types particularly suitable for circuit designs that now require several low-current types connected in parallel.

° Formerly RCA Dev. Nos. TA7016 and TA7017, respectively.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		2N5575	2N5578	
*COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	70	90	V
*COLLECTOR-TO-EMITTER VOLTAGE:				
With base open, sustaining	$V_{CEO(sus)}$	50	70	V
With external base-to-emitter resistance (R_{BE}) = 10 Ω & V_{BE} = −1.5 V	V_{CEX}	70	90	V
*EMITTER-TO-BASE VOLTAGE	V_{EBO}	8	8	V
*COLLECTOR CURRENT (Continuous)	I_C	80	60	A
*COLLECTOR CURRENT (Peak)		100	80	A
*BASE CURRENT (Continuous)	I_B	20	15	A
*TRANSISTOR DISSIPATION:	P_T			
At case temperatures up to 25°C and V_{CE} up to 25 V		300	300	W
At case temperatures of 100°C and V_{CB} of 25 V		150	150	W
At case temperatures up to 25°C and V_{CE} above 25 V		See Fig. 1		
At case temperatures above 25°C and V_{CE} above 25 V		See Figs. 1 & 2		
*TEMPERATURE RANGE:				
Operating (Junction)		−65 to 175		°C
Storage		−65 to 200		°C
*PIN TEMPERATURE (During Soldering):				
At distance ≥ 1/32 in. (0.8 mm) from case 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		2N5575		2N5578		
			V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
*	Collector Cutoff Current: With base-emitter junction reverse-biased	I_{CEV}	60 80	−1.5 −1.5			– –	10 –	– –	– 10	mA
	With external base-emitter resistance (R_{BE})=10 Ω	I_{CER}	50 70				– –	10 –	– –	– 10	mA
*	With base-emitter junction reverse-biased	I_{CEV} (T_C=150°C)	60 80	−1.5 −1.5			– –	20 –	– –	– 20	mA
*	Emitter Cutoff Current	I_{EBO}		−8			–	10	–	10	mA
*	Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$			0.2	0	50	–	70	–	
*	DC Forward Current Transfer Ratio	h_{FE}[a]	3 4		40[a] 60[a]		– 10	– 40	10 –	40 –	
	Collector-to-Emitter Sustaining Voltage: (See Figs. 5 and 6) With base open	$V_{CEO(sus)}$			0.2		50[b]	–	70[b]	–	V
	With base-emitter junction reverse-biased, R_{BE}=10 Ω	$V_{CEX(sus)}$		−1.5	0.2		70[b]	–	90[b]	–	V
	Base-to-Emitter Voltage	V_{BE}[a]	4 4		40[a] 60[a]		– –	– 3	– –	2.5 –	V
*	Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$[a]			40[a] 60[a]	4 6	– –	– 2	– –	1.5 –	V
*	Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$[a]			40[a] 60[a]	4 6	– –	– 3	– –	2.5 –	V
	Output Capacitance: (V_{CB} = 10 V)	C_{ob}					–	2000	–	2000	pF
	Input Capacitance	C_{ib}		−0.5	0		–	4000	–	4000	pF
*	Magnitude of Common-Emitter, Small-Signal, Short-Circuit Forward Current Transfer Ratio (f=0.2 MHz)	$\|h_{fe}\|$	4		10		2	–	2	–	
*	Saturated Switching Time (V_{CC} = 30 V):				40	4	–	–	–	10	
	Turn-on time	t_{ON}			60	6	–	15	–	–	μs
	Turn-off time	t_{OFF}			40 60	4 6	– –	– 15	– –	10 –	
	Forward-Bias Second-Breakdown Collector Current (t = 1 s)	$I_{S/b}$	25				12	–	12	–	A

[a]Pulsed; pulse duration ≤ 350 μs, duty factor=0.02.

[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. 5.

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

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS				LIMITS				UNITS
		Voltage V dc		Current A dc		2N5575		2N5578		
		V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
Second Breakdown Energy (With base reverse-biased, R_{BE}=10 Ω, L=33 mH)	$E_{S/b}$		−1.5	7		0.8	–	0.8	–	J
Thermal Resistance: (Junction-to-Case)	$R_{\theta JC}$					–	0.5	–	0.5	°C/W

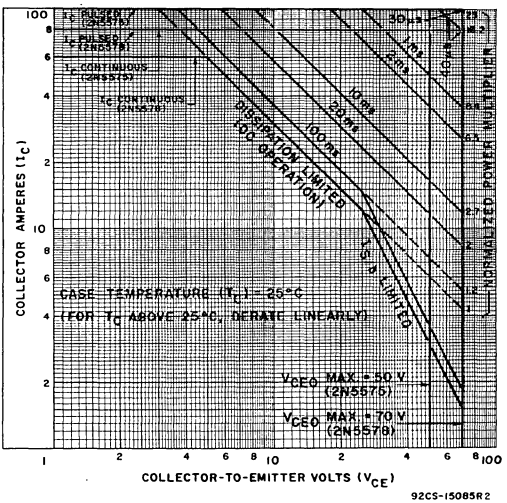


Fig. 1—Maximum operating areas for both types.

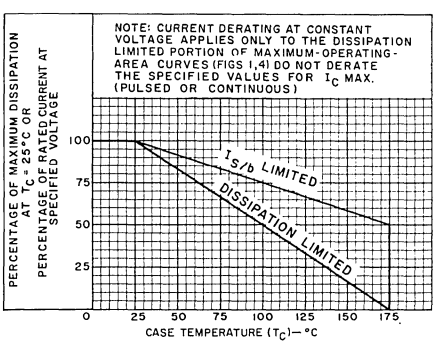


Fig. 2—Dissipation derating curves for both types.

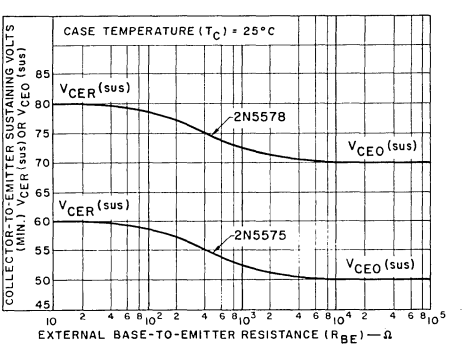


Fig. 3—Collector-to-emitter sustaining voltage characteristics for both types.

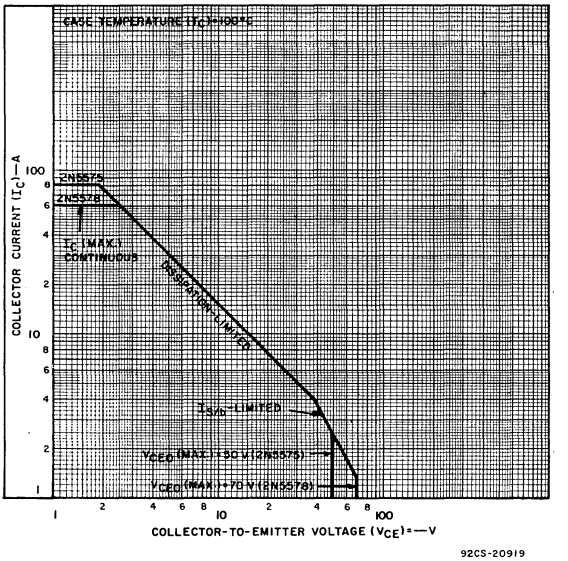


Fig. 4—Maximum operating areas for both types.

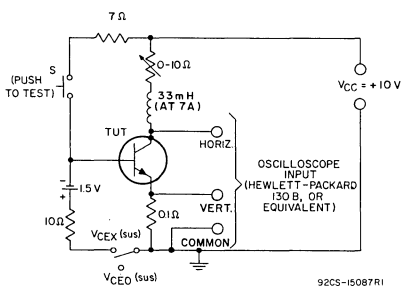
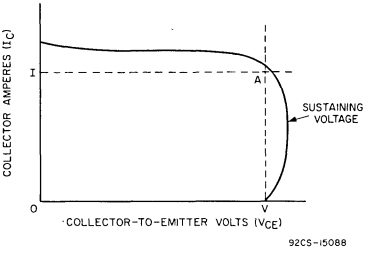


Fig. 5—Circuit used to measure sustaining voltages $V_{CEO}(sus)$ and $V_{CEX}(sus)$ for both types.



NOTE:
The sustaining Voltage $V_{CEO}(sus)$ or $V_{CEX}(sus)$ is acceptable when the trace falls to the right and above point "A". (For values of current and voltage, see *Electrical Characteristics.*)

Fig. 6—Oscilloscope display for measurement of sustaining voltages (test circuit shown in Fig. 5).

TERMINAL CONNECTIONS

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

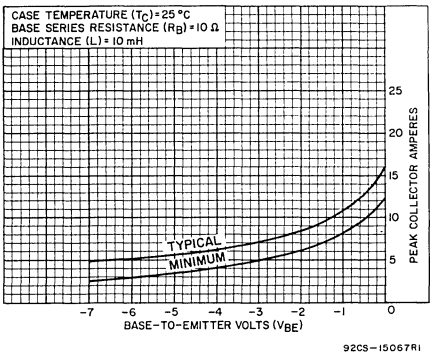


Fig. 7—Reverse-bias second-breakdown characteristics for both types.

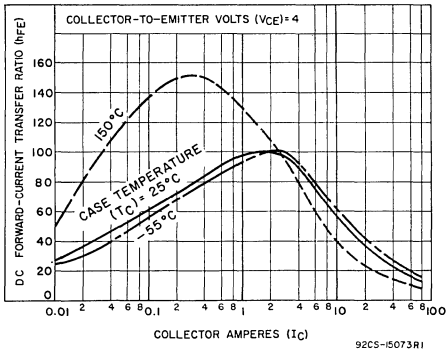


Fig. 8—Typical dc beta characteristics for type 2N5575.

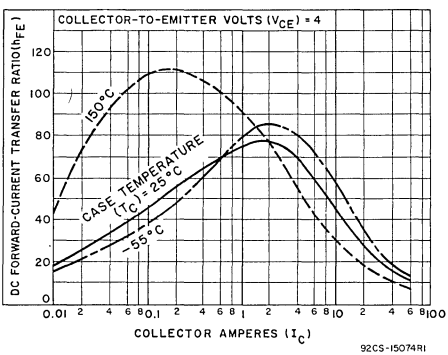


Fig. 9—Typical dc beta characteristics for type 2N5578.

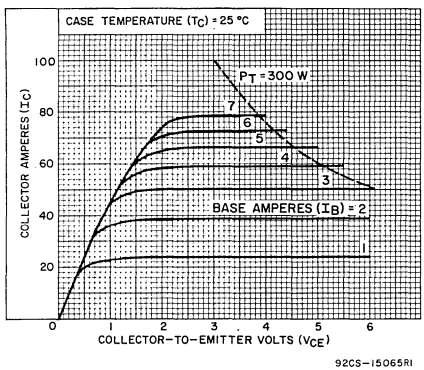


Fig. 10—Typical output characteristics for type 2N5575.

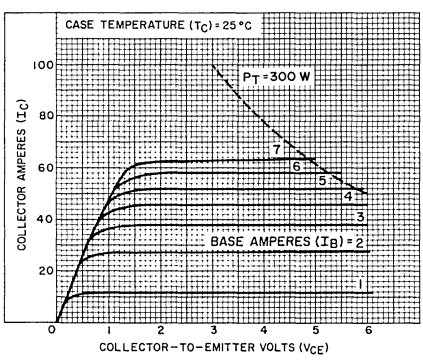


Fig. 11—Typical output characteristics for type 2N5578.

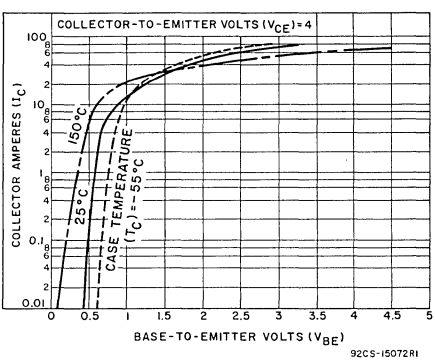


Fig. 12—Typical transfer characteristics for type 2N5575.

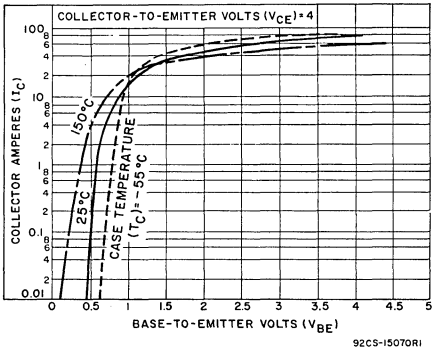


Fig. 13—Typical transfer characteristics for type 2N5578.

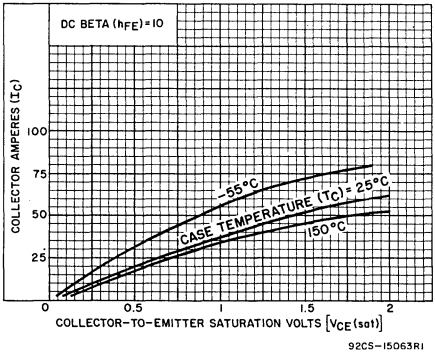


Fig. 14—Typical saturation voltage characteristics for type 2N5575.

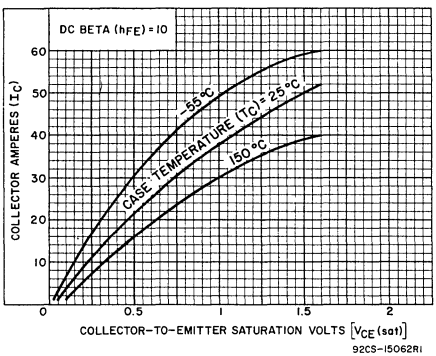


Fig. 15—Typical saturation voltage characteristics for type 2N5578.

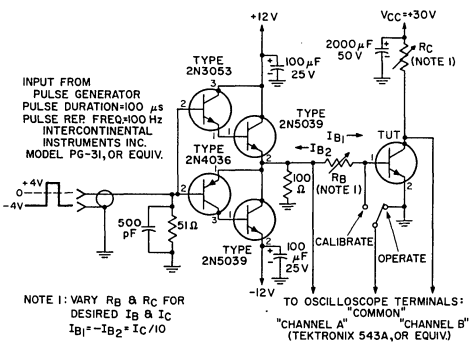


Fig. 16—Circuit used to measure switching times for both types.

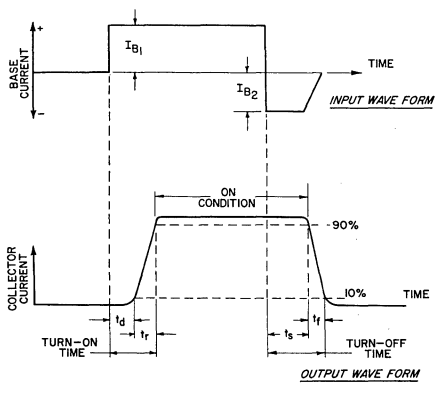


Fig. 17—Oscilloscope display for measurement of switching times (test circuit shown in Fig. 16).

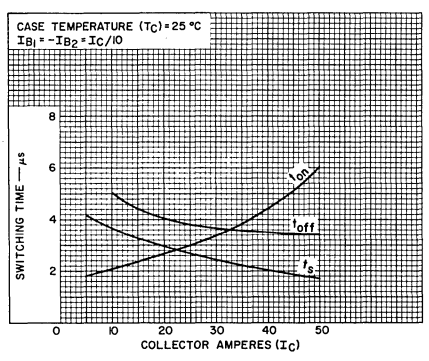


Fig. 18—Typical saturated switching characteristics for both types.