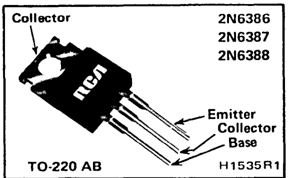
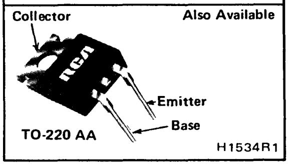
RCA
Solid State
Division

Power Transistors

2N6386 2N6387 2N6388





10-Ampere, N-P-N Darlington Power Transistors

40-60-80 Volts, 40 Watts
Gain of 1000 at 5 A (2N6387, 2N6388)
Gain of 1000 at 3 A (2N6386)

Features:

- Operates from IC without predriver
- Low leakage at high temperature
- High reverse second-breakdown capability

Applications:

- Power switching
- Audio amplifiers
- Hammer drivers
- Series and shunt regulators

The 2N6386, 2N6387, and 2N6388• are monolithic n-p-n silicon Darlington transistors designed for low- and medium-frequency power applications. The double epitaxial construction of these devices provides good forward and reverse second-breakdown capability; their high gain makes it possible for them to be driven directly from integrated circuits.

• Formerly RCA Dev. Nos. TA8202, TA8485, and TA8201, respectively.

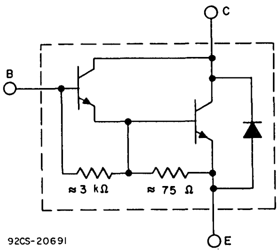


Fig. 1—Schematic diagram for all types.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		2N6388	2N6387	2N6386	
* COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	80	60	40	V
COLLECTOR-TO-EMITTER VOLTAGE:					
With external base-to-emitter resistance (R_{BE}) = 100Ω, sustaining	$V_{CER}(sus)$	80	60	40	V
With base open, sustaining	$V_{CEO}(sus)$	80	60	40	V
* With base reverse-biased $V_{BE} = -1.5$ V	V_{CEX}	80	60	40	V
* EMITTER-TO-BASE VOLTAGE	V_{EBO}	5	5	5	V
COLLECTOR CURRENT:	I_C				
* Continuous		10	10	8	A
Peak		15	15	15	A
* CONTINUOUS BASE CURRENT	I_B	0.25	0.25	0.25	A
* TRANSISTOR DISSIPATION:	P_T				
At case temperatures up to 25°C		40	40	40	W
At case temperatures above 25°C		←	See Fig. 3	→	
TEMPERATURE RANGE:					
Storage and Operating (Junction)		←	−65 to +150	→	°C
* LEAD TEMPERATURE (During Soldering):					
At distances ≥ 1/8 in.(3.17 mm) from case for 10 s max.		←	235	→	°C

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

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

	CHARACTERISTIC	SYMBOL	TEST CONDITIONS: VOLTAGE V dc		CURRENT A dc		LIMITS: 2N6388		2N6387		2N6386		UNITS
			V_{CE}	V_{BE}	I_C	I_B	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
*	Collector-Cutoff Current: With base open	I_{CEO}	80 60 40			0 0 0	– – –	1 – –	– – –	.. 1 –	– – –	– – 1	mA
	With base open and T_C = 150°C	I_{CEO}	80 60 40			0 0 0	– – –	10 – –	– – –	– 10 –	– – –	– – 10	mA
*	With base reverse-biased	I_{CEV}	80 60 40	−1.5 −1.5 −1.5			– – –	0.3 – –	– – –	– 0.3 –	– – –	– – 0.3	mA
*	With base reverse-biased and T_C = 150°C	I_{CEV}	80 60 40	−1.5 −1.5 −1.5			– – –	3 – –	– – –	– 3 –	– – –	– – 3	mA
*	Emitter-Cutoff Current	I_{EBO}		−5	0		-	5	–	5	–	5	mA
*	Collector-to-Emitter Sustaining Voltage: With base open	$V_{CEO}(sus)$			0.2[a]	0	80	-	60	–	40	–	V
	With external base-to-emitter resistance (R_{BE}) = 100Ω	$V_{CER}(sus)$			0.2[a]		80		60	-	40	–	V
	With base-emitter junction reverse-biased	$V_{CEV}(sus)$		1.5	0.2[a]		80		60	–	40	–	V
*	DC Forward Current Transfer Ratio	h_{FE}	3 3 3 3		3[a] 5[a] 8[a] 10[a]		– 1000 – 100	– 20,000 – –	– 1000 – 100	– 20,000 – –	1000 – 100 –	20,000 – – –	
*	Base-to-Emitter Voltage	V_{BE}	3 3 3 3		3[a] 5[a] 8[a] 10[a]		– – – –	– 2.8 – 4.5	– – – –	– 2.8 – 4.5	– – – –	2.8 – 4.5 –	V
*	Collector-to-Emitter Saturation Voltage	$V_{CE}(sat)$			3[a] 5[a] 8[a] 10[a]	0.006[a] 0.01[a] 0.08[a] 0.1[a]	– – – –	– 2 – 3	– – – –	– 2 – 3	– – – –	2 – 3 –	V
	Parallel Diode Forward Voltage Drop	V_F			−8 −10		– –	– 4	– –	– 4	– –	4 –	V
*	Common-Emitter, Small-Signal, Short-Circuit Forward Current Transfer Ratio (f = 1 kHz)	h_{fe}	5		1		1000		1000	-	1000	–	
*	Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward Current Transfer Ratio (f = 1.0 MHz)	$\|h_{fe}\|$	5		1		20		20	..	20	–	
*	Common Base Output Capacitance (V_{CB} = 10 V, f = 1 MHz)	C_{ob}					–	200	–	200	–	200	pF
	Second Breakdown Energy With base reverse-biased and L = 12 mH, R_{BE} = 100Ω	$E_{S/b}$[b]		−1.5	4.5		120		120	-	120	–	mJ
	Forward-Bias Second Break-down Collector Current (0.5-s non-repetitive pulse)	$I_{S/b}$	35				1.2	-	1.2	–	1.2	–	A
	Thermal Resistance Junction-to-Case	$R_{\theta JC}$					–	3.12	–	3.12	–	3.12	°C/W

[a] Pulsed: Pulse duration = 300 μs, duty factor = 1.8%.

[b] $E_{S/b}$ is defined as the energy at which second breakdown occurs under specified reverse bias conditions. $E_{S/b}$ = ½LI^2 where L is a series load or leakage inductance, and I is the peak collector current.

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

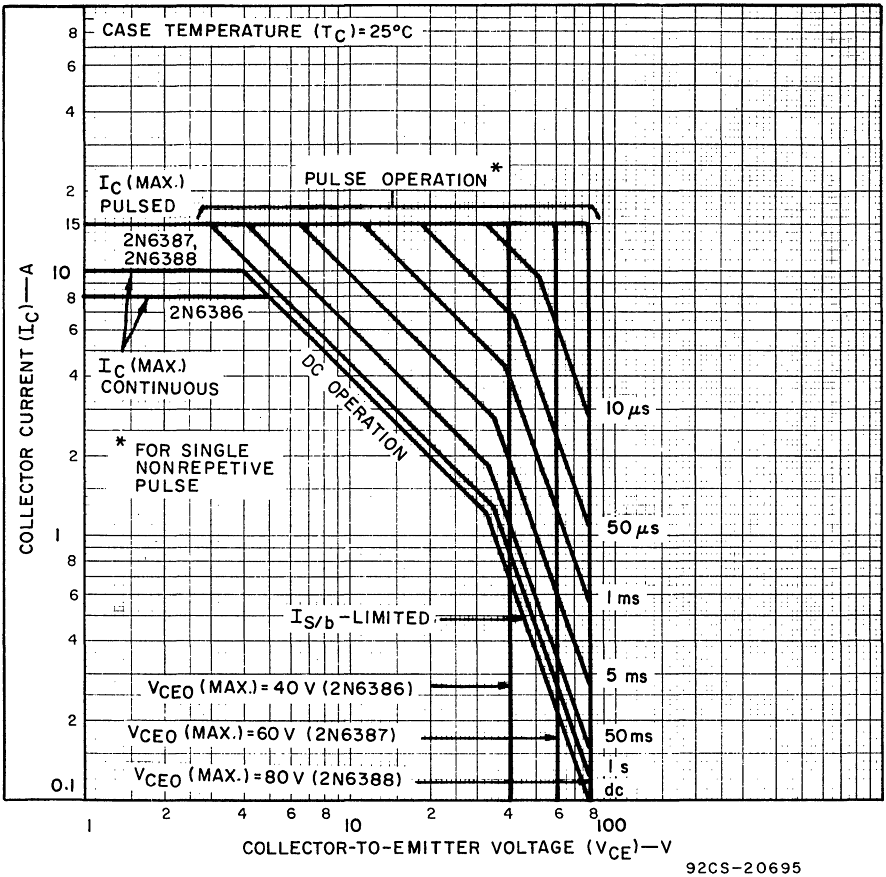


Fig. 2—Maximum operating area for all types.

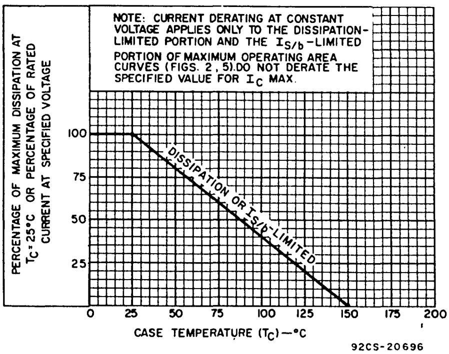


Fig. 3—Derating curves for all types.

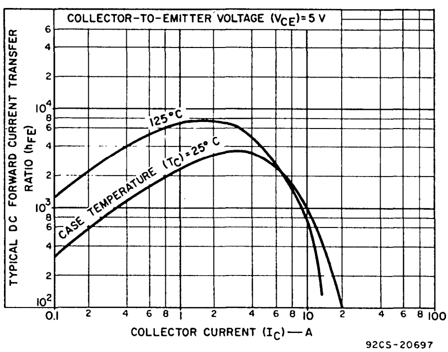


Fig. 4—Typical dc-beta characteristics for all types.

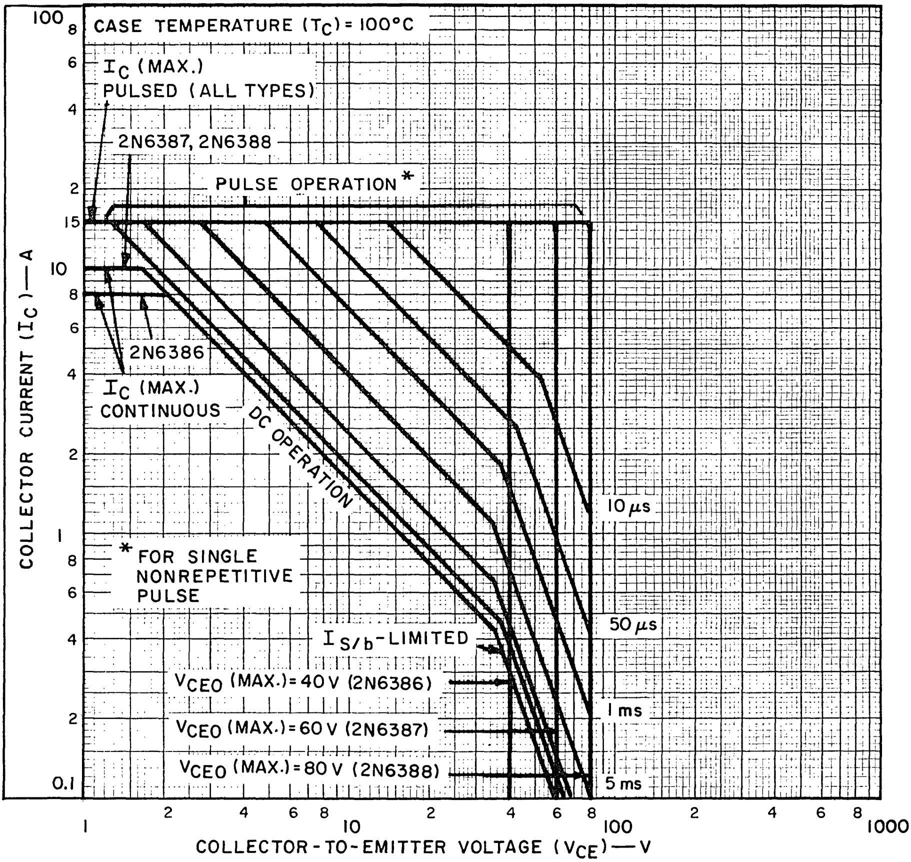


Fig. 5—Maximum operating area for all types.

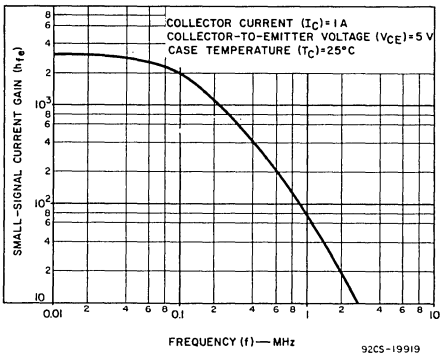


Fig. 6—Typical small-signal gain for all types.

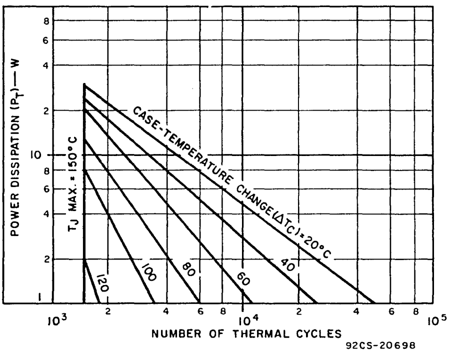


Fig. 7—Thermal-cycling rating chart for all types.

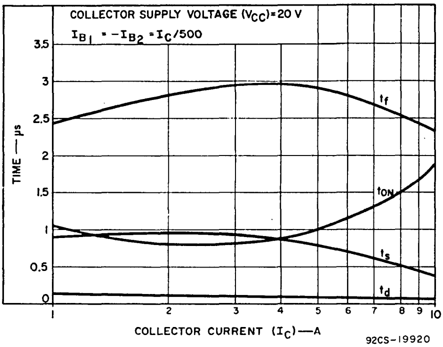


Fig. 8—Typical saturated switching-time characteristics for all types.

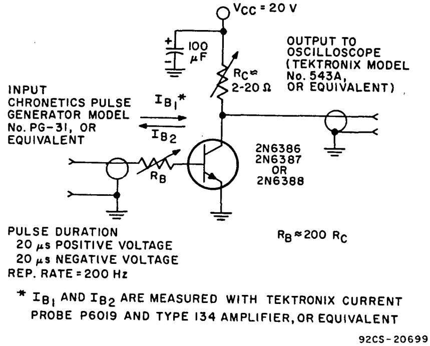


Fig. 9—Circuit used to measure saturated switching times.

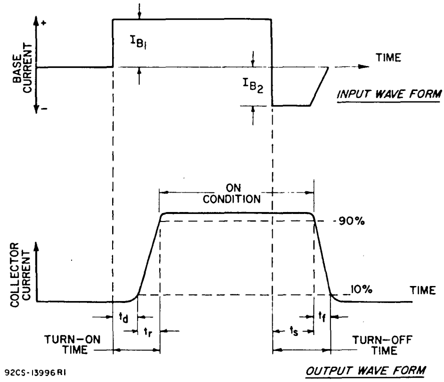


Fig. 10—Phase relationship between input current and output current showing reference points for specification of switching times (test circuit shown in Fig. 9).

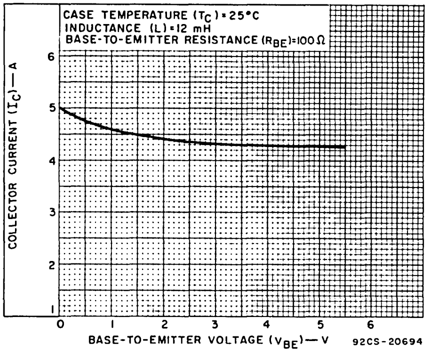


Fig. 11—Minimum values of reverse-bias second breakdown characteristic ($E_{S/b}$) for all types.

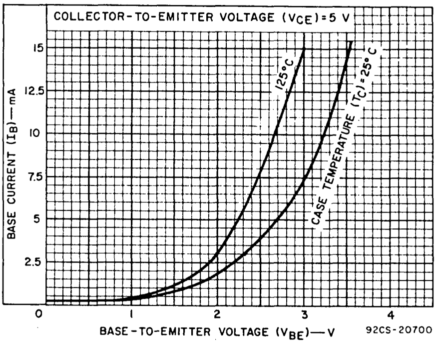


Fig. 12—Typical input characteristics for all types.

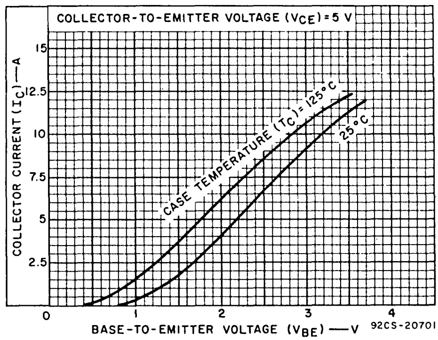


Fig. 13—Typical transfer characteristics for all types.

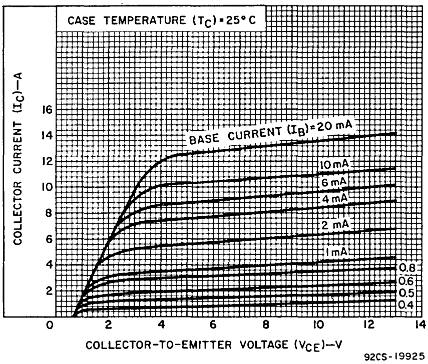


Fig. 14—Typical output characteristics for all types.

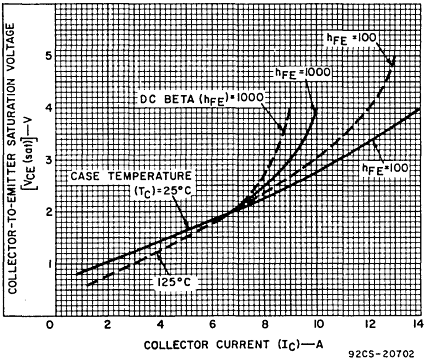


Fig. 15—Typical saturation characteristics for all types.

TERMINAL CONNECTIONS

Lead No. 1 – Base
Stub – Do not use stub as tie point.
Lead No. 3 – Emitter
Mounting Flange – Collector

TERMINAL CONNECTIONS

Lead No. 1 – Base
Lead No. 2 – Collector
Lead No. 3 – Emitter
Mounting Flange – Collector