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High-Speed Power Transistors

2N6032, 2N6033

File Number 462

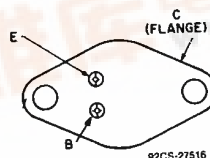
High-Current, High-Speed High-Power Transistors

Silicon N-P-N Types for High-Speed Switching and Linear-Amplifier Applications in Military, Industrial and Commercial Equipment

Features:

- Low $V_{CE(sat)}$ = 1 V max. at 40 A, 1.3 V max. at 50 A
- Maximum safe-area-of-operation curves
 I_{B/I_C} limit line beginning at 24 V
- Fast storage time:
 t_s = 1.5 μ s max. at I_C = 40 A (2N6033), 50 A (2N6032)

TERMINAL DESIGNATIONS



JEDEC TO-204AE

The RCA-2N6032 and 2N6033* are epitaxial silicon n-p-n transistors having high-current and high-power handling capability and fast switching speed. The 2N6033 is similar to the 2N6032; they differ in maximum values for continuous collector current and sustaining voltage.

They are supplied in the JEDEC TO-204AE hermetic steel package with 0.060-inch diameter pins.

*Formerly RCA Dev. Types TA7337 and TA7337A, respectively.

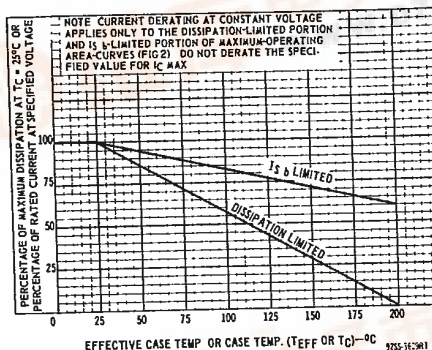


Fig. 1 - Derating curves for both types.

MAXIMUM RATINGS, Absolute-Maximum Values:

	2N6032	2N6033	
COLLECTOR-TO-BASE VOLTAGE, V_{CBO}	120	150	V
COLLECTOR-TO-EMITTER SUSTAINING VOLTAGE:			
With base open, $V_{CEO(sus)}$	90	120	V
With external base-to-emitter resistance (R_{BE}) $\leq 50 \Omega$, $V_{CE(sus)}$	110	140	V
With external base-to-emitter resistance (R_{BE}) $\leq 50 \Omega$ & $V_{BE} = -1.5$ V, $V_{CE(sus)}$	120	150	V
EMITTER-TO-BASE VOLTAGE, V_{EB0}	7	7	V
CONTINUOUS COLLECTOR CURRENT, I_C	50	40	A
BASE CURRENT, I_B	10	10	A
EMITTER CURRENT, I_E	50	40	A
TRANSISTOR DISSIPATION, P_T :			
At case temperatures up to 25°C and V_{CE} up to 24 V	140	140	W
At case temperatures up to 25°C and V_{CE} above 24 V	See Fig. 2 See Figs. 2 & 3		
At case temperatures above 25°C and V_{CE} above 24 V			
TEMPERATURE RANGE:			
Storage & Operating (Junction)	-65 to +200		°C
PIN TEMPERATURE (During Soldering):			
At distance $\geq 1/32$ in. (0.8 mm) from seating plane for 10 s max.	230		°C

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

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS							LIMITS				UNITS
		DC Collector Voltage (V)		DC Emitter or Base Voltage (V)		DC Current (A)			Type 2N6032		Type 2N6033		
		V _{CB}	V _{CE}	V _{EB}	V _{BE}	I _C	I _E	I _B	Min.	Max.	Min.	Max.	
Collector-Cutoff Current: With base open	I _{CEO}	—	80	—	—	—	—	0	—	10	—	10	mA
* With base-emitter junction reverse biased (T _C = 150°C)	I _{CEV}	—	110	—	-1.5	—	—	—	—	12	—	—	mA
		—	135	—	-1.5	—	—	—	—	—	—	10	mA
		—	100	—	-1.5	—	—	—	—	15	—	10	mA
* Emitter-Cutoff Current	I _{EBO}	—	—	7	—	0	—	—	—	10	—	10	mA
Collector-to-Emitter Sustaining Voltage: (See Figs. 12 & 13) With base open	V _{CEO(sus)}	—	—	—	—	0.2	—	0	90 ^a	—	120 ^a	—	V
With external base to emitter resistance (R _{BE}) ≤ 50 Ω	V _{CER(sus)}	—	—	—	—	0.2	—	0	110 ^a	—	140 ^a	—	
With base-emitter junction reverse biased & R _{BE} ≤ 50 Ω	V _{CEX(sus)}	—	—	—	-1.5	0.2	—	0	120 ^a	—	150 ^a	—	
* Base-to-Emitter Saturation Voltage ^c	V _{BE(sat)}	—	—	—	—	50	—	5	—	2	—	—	V
		—	—	—	—	40	—	4	—	—	—	2	V
Base-to-Emitter Voltage	V _{BE}	—	2	—	—	50	—	—	—	2	—	—	V
		—	2	—	—	40	—	—	—	—	—	2	V
* Collector-to-Emitter Saturation Voltage ^c	V _{CE(sat)}	—	—	—	—	50	—	5	—	1.3	—	—	V
		—	—	—	—	40	—	4	—	—	—	1	V
* DC Forward-Current Transfer Ratio ^c	h _{FE}	—	2.6	—	—	50	—	—	10	50	—	—	
		—	2	—	—	40	—	—	—	—	10	50	
Second-Breakdown Collector Current With base forward biased	I _{S/b} ^b	—	24	—	—	—	—	—	5.8 ^c	—	5.8 ^c	—	A
		—	40	—	—	—	—	—	0.9 ^c	—	0.9 ^c	—	A
* Magnitude of common-emitter small-signal, short-circuit, forward-current transfer ratio (at 5 MHz)	h _{fe}	—	10	—	—	2	—	—	10	—	10	—	
Gain-Bandwidth Product	f _T	—	10	—	—	2	—	—	50	—	50	—	MHz
Output Capacitance (at 1 MHz)	C _{obo}	10	—	—	—	—	0	—	—	800	—	800	pF
Saturated Switching Time: Turn-On (Delay Time + Rise Time)	t _{on}	V _{CC} = 30V	—	—	—	50	—	5 ^e	—	1	—	—	μs
		V _{CC} = 30V	—	—	—	40	—	4 ^e	—	—	—	1	μs
* Rise	t _r	V _{CC} = 30V	—	—	—	50	—	5 ^e	—	1	—	—	μs
		V _{CC} = 30V	—	—	—	40	—	4 ^e	—	—	—	—	μs
* Storage	t _s	V _{CC} = 30V	—	—	—	50	—	5 ^e	—	1.5	—	1.5	μs
		V _{CC} = 30V	—	—	—	40	—	4 ^e	—	—	—	—	μs
* Fall	t _f	V _{CC} = 30V	—	—	—	50	—	5 ^e	—	0.5	—	—	μs
		V _{CC} = 30V	—	—	—	40	—	4 ^e	—	—	—	0.5	μs
Thermal Resistance (Junction-to-Case)	θ _{J-C}	—	20	—	—	2.5	—	—	—	1.25	—	1.25	°C/W

^a CAUTION: The sustaining voltages $V_{CEO(sus)}$, $V_{CER(sus)}$, and $V_{CEX(sus)}$ MUST NOT be measured on a curve tracer.^b $I_{S/b}$ is defined as the current at which second breakdown occurs at a specified collector voltage with the emitter-base junction forward biased for transistor operation in the active region.^c Pulsed; 1-s, non-repetitive pulse.^e $I_{B1} = I_{B2}$ *In accordance with JEDEC registration format JS-6 RDF-1.

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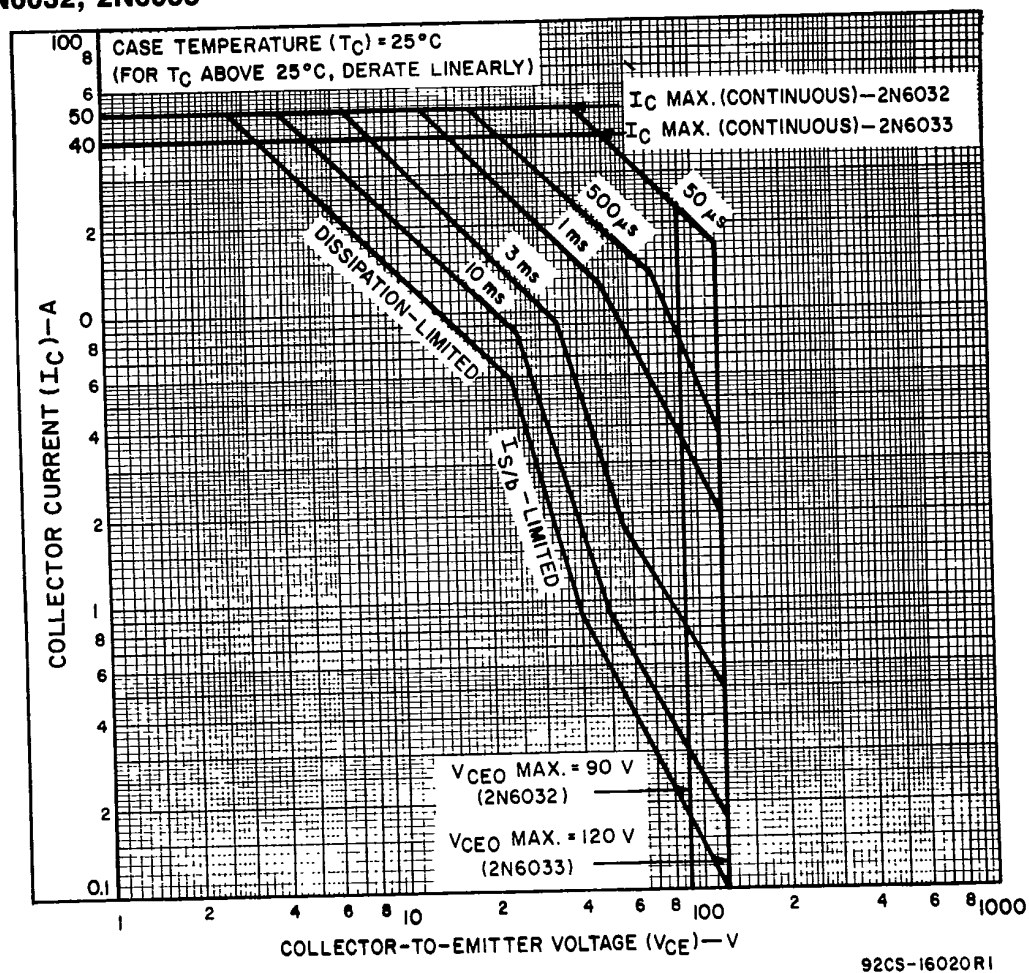
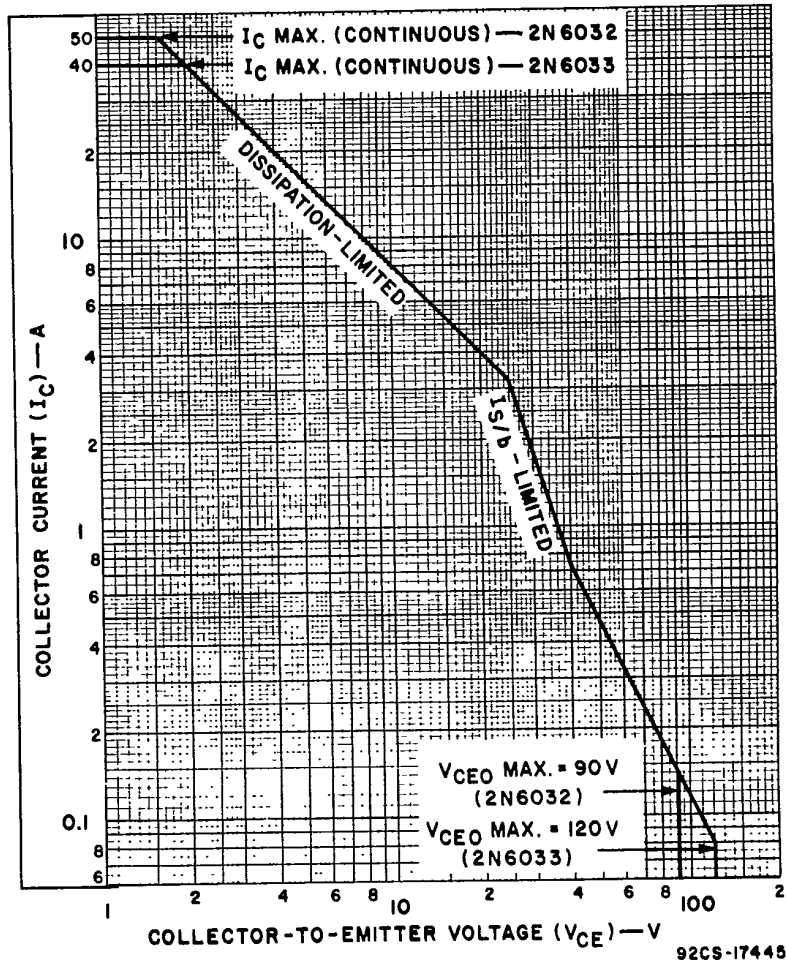


Fig. 2 - Maximum operating area for both types.

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Fig. 3 - Maximum operating areas for both types at case temperature (T_c) = 100°C.

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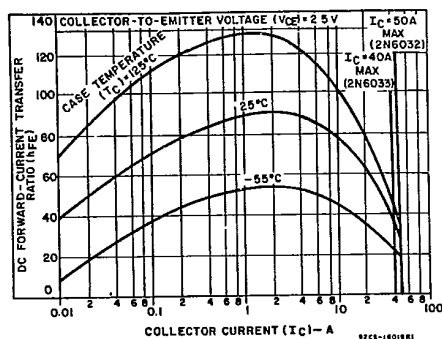


Fig. 4 - Typical dc-beta characteristics for both types.

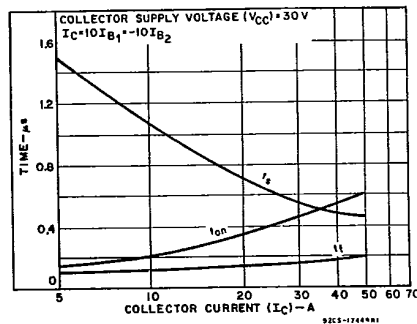


Fig. 5 - Typical saturated switching characteristics for both types.

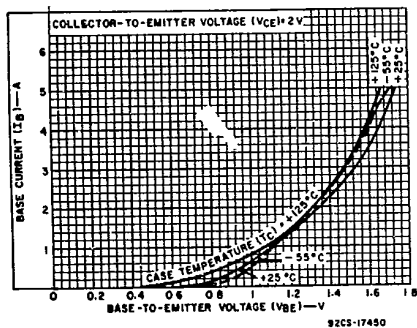


Fig. 6 - Typical input characteristics for both types.

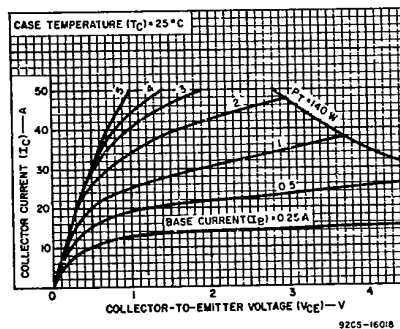


Fig. 7 - Typical collector characteristics for both types.

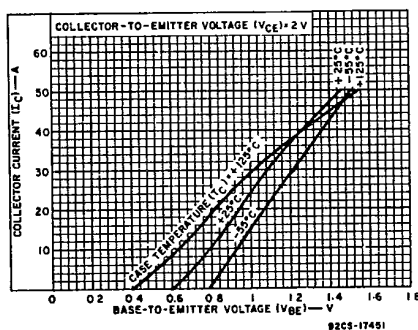


Fig. 8 - Typical transfer characteristics for both types.

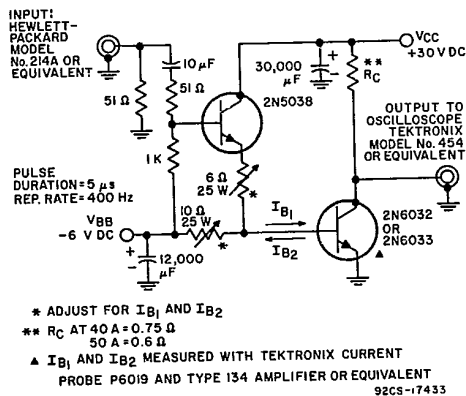


Fig. 9 - Switching-time test set.