2N6032, 2N6033

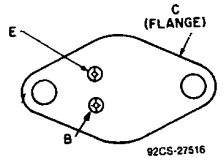
File Number **462**

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 $I_{s/b}$ limit line beginning at 24 V*
- *Fast storage time: t_s=1.5μs 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.

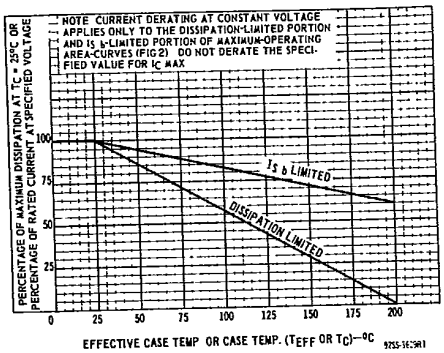


Fig. 1 - Derating curves for both types.

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})≤50 Ω, $V_{CER}(sus)$	110	140	V
* With external base-to-emitter resistance (R_{BE})≤50 Ω & V_{BE}=-1.5 V, $V_{CEX}(sus)$	120	150	V
* EMITTER-TO-BASE VOLTAGE, V_{EBO}	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		
At case temperatures above 25° C and V_{CE} above 24 V	See Figs. 2 & 3		
* TEMPERATURE RANGE:			
Storage & Operating (Junction)	-65 to +200		°C
* PIN TEMPERATURE (During Soldering):			
At distance ≥ 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).

2N6032, 2N6033

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

	CHARACTERISTIC	SYMBOL	TEST CONDITIONS: DC Collector Voltage (V) V_{CB}	V_{CE}	DC Emitter or Base Voltage (V) V_{EB}	V_{BE}	DC Current (A) I_C	I_E	I_B	LIMITS: Type 2N6032 Min.	Type 2N6032 Max.	Type 2N6033 Min.	Type 2N6033 Max.	UNITS
	Collector-Cutoff Current: With base open	I_{CEO}	–	80	–	–	–	–	0	–	10	–	10	mA
*	With base-emitter junction reverse biased	I_{CEV}	–	110	–	-1.5	–	–	–	–	12	–	–	mA
			–	135	–	-1.5	–	–	–	–	–	–	10	
	(T_C = 150°C)		–	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)*	$V_{CEO(sus)}$	–	–	–	–	0.2	–	0	90[a]	–	120[a]	–	V
*	With base open													
	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	
	Base-to-Emitter Voltage	V_{BE}	–	2	–	–	50	–	–	–	2	–	–	V
			–	2	–	–	40	–	–	–	–	–	2	
*	Collector-to-Emitter Saturation Voltage[c]	$V_{CE(sat)}$	–	–	–	–	50	–	5	–	1.3	–	–	V
			–	–	–	–	40	–	4	–	–	–	1	
*	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]	–	
*	Magnitude of common-emitter small-signal, short-circuit, forward-current transfer ratio (at 5 MHz)	$\lvert h_{fe} \rvert$		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
				–	–	–	40	–	4[e]	–	–	–	1	
*	Rise	t_r	V_{CC}= 30V	–	–	–	50	–	5[e]	–	1	–	–	μs
				–	–	–	40	–	4[e]	–	–	–	1	
*	Storage	t_s	V_{CC}= 30V	–	–	–	50	–	5[e]	–	1.5	–	–	μs
				–	–	–	40	–	4[e]	–	–	–	1.5	
*	Fall	t_f	V_{CC}= 30V	–	–	–	50	–	5[e]	–	0.5	–	–	μs
				–	–	–	40	–	4[e]	–	–	–	0.5	
	Thermal Resistance (Junction-to-Case)	$\theta_{J\text{-}C}$	–	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] $I_{B_1} = I_{B_2}$ *In accordance with JEDEC registration format JS-6 RDF-1.

2N6032, 2N6033

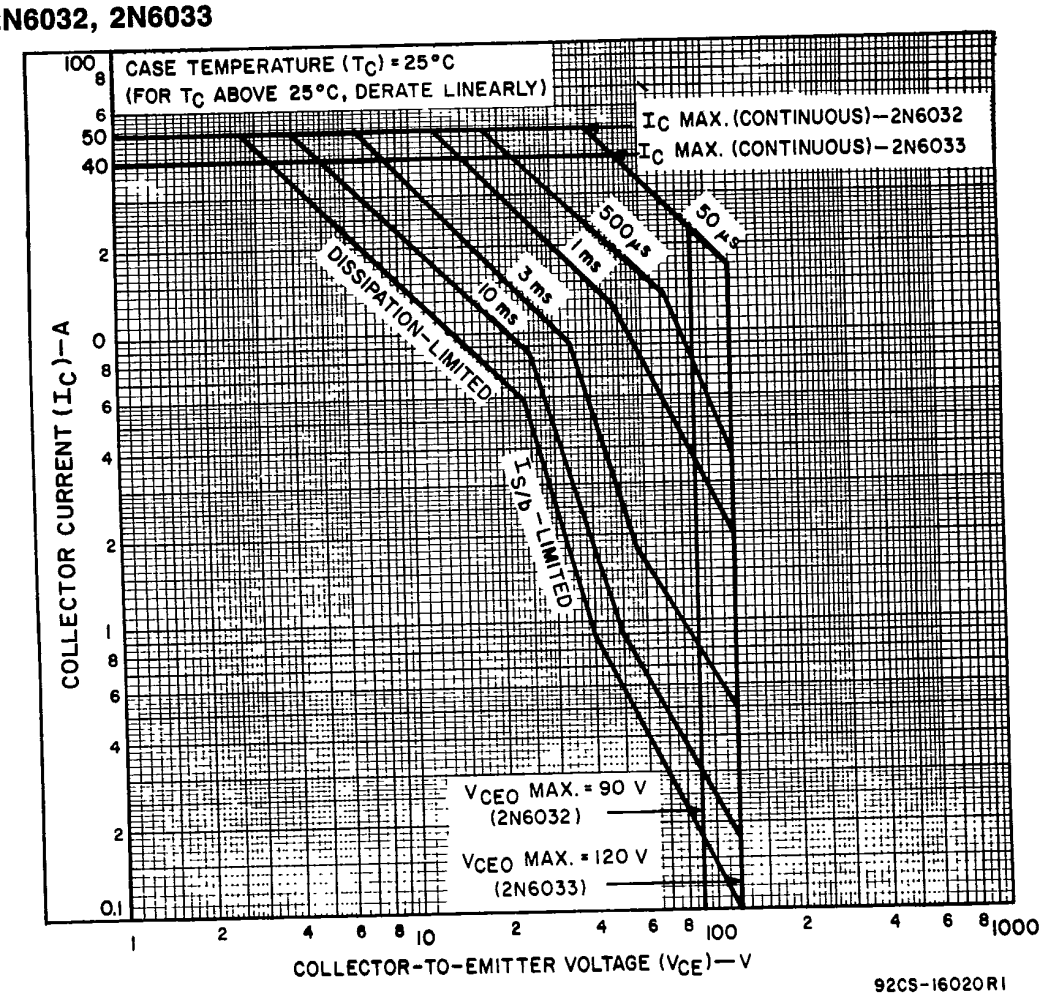


Fig. 2 - Maximum operating area for both types.

2N6032, 2N6033

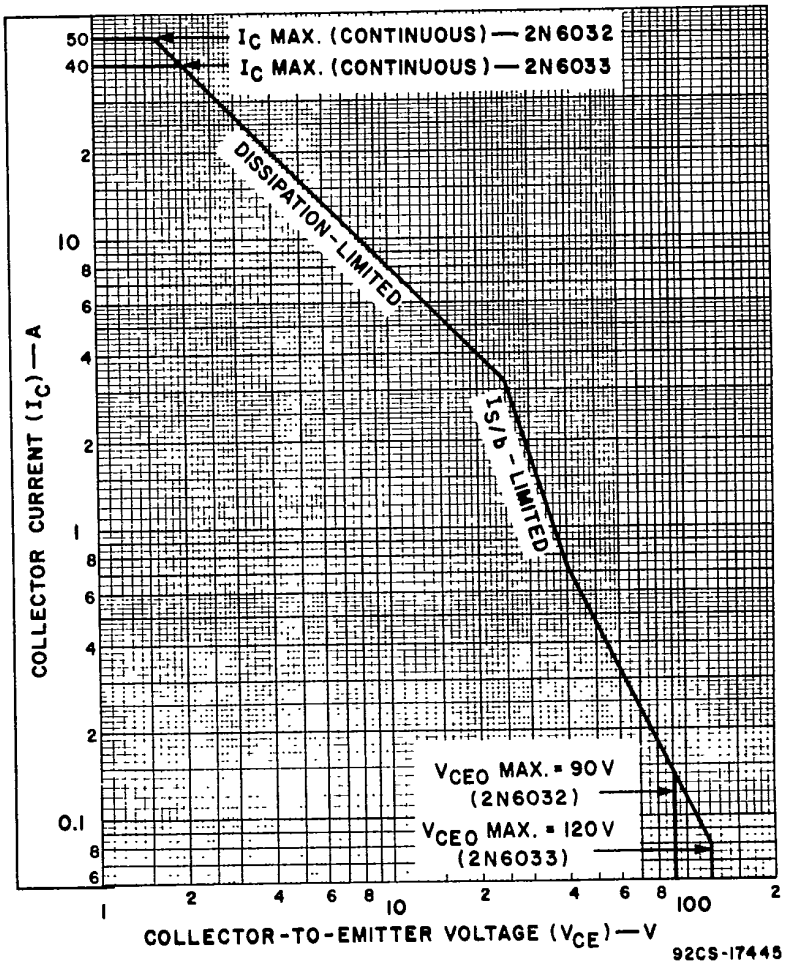


Fig. 3 - Maximum operating areas for both types at case temperature (T_C) = 100°C.

2N6032, 2N6033

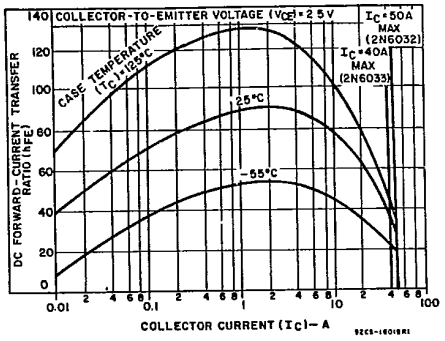


Fig. 4 - Typical dc-beta characteristics for both types.

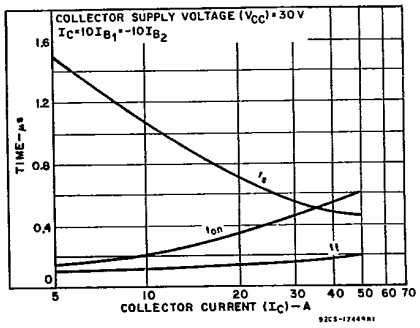


Fig. 5 - Typical saturated switching characteristics for both types.

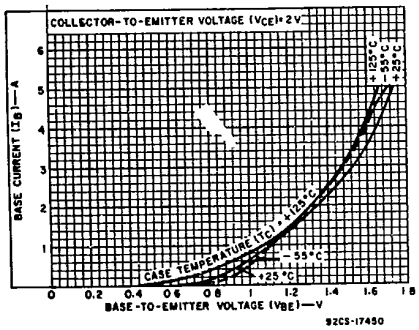


Fig. 6 - Typical input characteristics for both types.

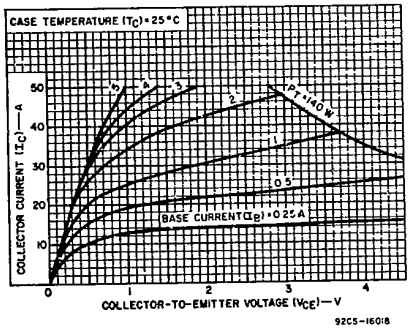


Fig. 7 - Typical collector characteristics for both types.

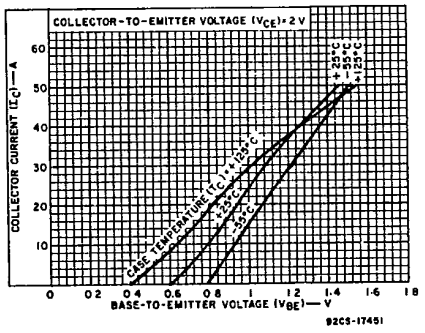


Fig. 8 - Typical transfer characteristics for both types.

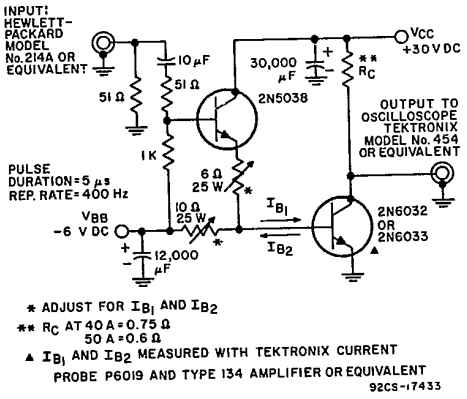


Fig. 9 - Switching-time test set.