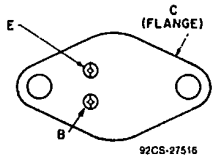
2N5301, 2N5302, 2N5303

File Number **1029**

High-Current High-Power High-Speed N-P-N Power Transistors

Features:
- *Specification for h_{FE} and $V_{CE}(sat)$ up to 30 A*
- *Current gain-bandwidth product f_T = 2 MHz min. at 1 A*
- *Low saturation voltage with high beta*
- *High dissipation capability*

TERMINAL DESIGNATIONS



JEDEC TO-204AA

The RCA-2N5301, 2N5302 and 2N5303 are epitaxial-base silicon n-p-n transistors intended for a wide variety of high-power, high-current applications, such as power-switching circuits, driver and output stages for series and shunt regulators, dc-to-dc converters, inverters, and solenoid (hammer)/relay drivers.

These devices differ in maximum voltage ratings and $V_{CE}(sat)$, $V_{BE}(sat)$, and V_{BE} characteristics. All are supplied in JEDEC TO-204AA hermetic steel packages.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

	2N5301	2N5302	2N5303	
* V_{CBO}	40	60	80	V
* $V_{CEO}(sus)$	40	60	80	V
* V_{EBO}		5		V
* I_C		30		A
* I_{CM}		50		A
* I_B		7.5		A
I_{BM}		15		A
* P_T				
At $T_C \leq 25°C$		200		W
At $T_C > 25°C$ ... derate linearly		1.15		W/°C
		See Figs.1 & 2		
* T_J, T_{stg}		-65 to 200		°C
T_L				
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-2.

2N5301, 2N5302, 2N5303

ELECTRICAL CHARACTERISTICS, *at Case Temperature (T_C) = 25°C unless otherwise specified*

	CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
		VOLTAGE V dc		CURRENT A dc		2N5301		2N5302		2N5303		
		V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	Min.	Max.	
*	I_{CBO}	40[a]				–	1	–	–	–	–	mA
		60[a]				–	–	–	1	–	–	
		80[a]				–	–	–	–	–	1	
*	I_{CEX}	40	−1.5			–	1	–	–	–	–	
		60	−1.5			–	–	–	1	–	–	
		80	−1.5			–	–	–	–	–	1	
*	I_{CEX} T_C = 150°C	40	−1.5			–	10	–	–	–	–	
		60	−1.5			–	–	–	10	–	–	
		80	−1.5			–	–	–	–	–	10	
*	I_{CEO}	40				–	5	–	–	–	–	
		60				–	–	–	5	–	–	
		80				–	–	–	–	–	5	
*	I_{EBO}		−5			–	5	–	5	–	5	
*	h_{FE}	2		1[b]		40	–	40	–	40	–	
		2		10[b]		–	–	–	–	15	60	
		3		15[b]		15	60	15	60	–	–	
		2		20[b]		–	–	–	–	5	–	
		3		30[b]		5	–	5	–	–	–	
*	$V_{CEO(sus)}$			0.2		40	–	60	–	80	–	V
*	V_{BE}	2		10[b]		–	–	–	–	–	1.5	
		2		15[b]		–	1.7	–	1.7	–	–	
		4		20[b]		–	–	–	–	–	2.5	
		4		30[b]		–	3	–	3	–	–	
*	$V_{BE(sat)}$			10[b]	1	–	1.7	–	1.7	–	1.7	
				15[b]	1.5	–	1.8	–	1.8	–	2	
				20[b]	2	–	2.5	–	2.5	–	–	
				20[b]	4	–	–	–	–	–	2.5	
*	$V_{CE(sat)}$			10[b]	1	–	0.75	–	0.75	–	1	
				15[b]	1.5	–	–	–	–	–	1.5	
				20[b]	2	–	2	–	2	–	–	
				20[b]	4	–	–	–	–	–	2	
				30[b]	6	–	3	–	3	–	–	
	$I_{S/b}$ tp = 1 s nonrep.	20				10	–	10	–	10	–	A
*	$\|h_{fe}\|$ f = 1 MHz	10		1	–	2	–	2	–	2	–	
*	h_{fe} f = 1 kHz	10		1	–	40	–	40	–	40	–	
*	t_r (See Fig.8)	V_{CC} =		10	1	–	1	–	1	–	1	μs
*	t_s	30		10	1[c]	–	2	–	2	–	2	
*	t_f			10	1[c]	–	1	–	1	–	1	
	$R_{\theta JC}$	20		5	–	–	0.875	–	0.875	–	0.875	°C/W

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

[a] V_{CB}

[b] Pulsed; pulse duration = 300 μs, duty factor = 1.8%

[c] $I_{B_1} = -I_{B_2}$

2N5301, 2N5302, 2N5303

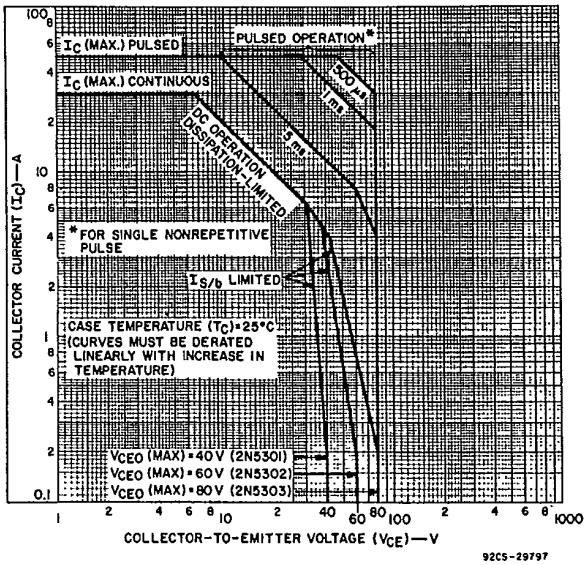


Fig. 1 — Maximum operating areas for 2N5301, 2N5302, and 2N5303.

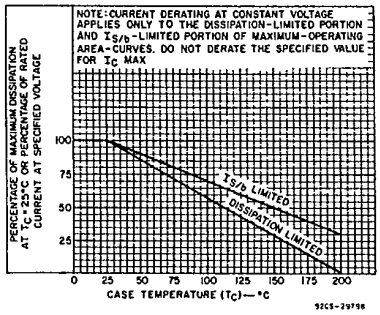


Fig. 2 — Derating curves for 2N5301, 2N5302, and 2N5303.

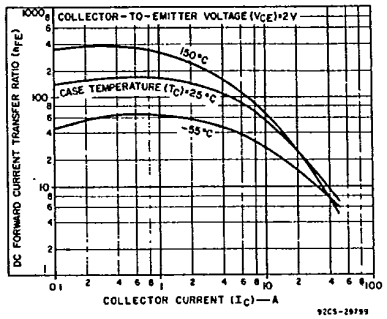


Fig. 3 — Typical dc beta characteristics as a function of collector current for 2N5301, 2N5302, and 2N5303.

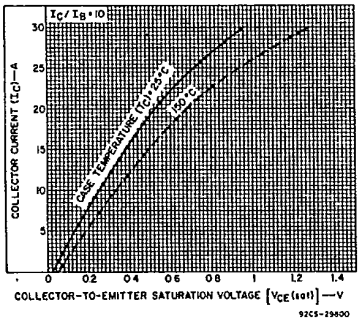


Fig. 4 — Typical saturation voltage characteristics for 2N5301, 2N5302, and 2N5303.

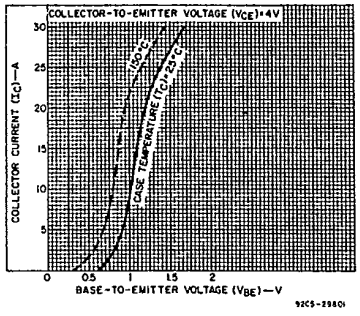


Fig. 5 — Typical transfer characreristics for 2N5301, 2N5302, and 2N5303.

2N5301, 2N5302, 2N5303

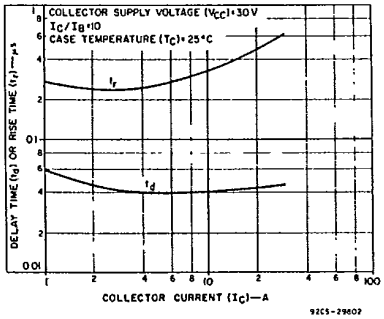


Fig. 6 – Typical delay-time and rise-time characteristics as a function of collector current for 2N5301, 2N5302, and 2N5303.

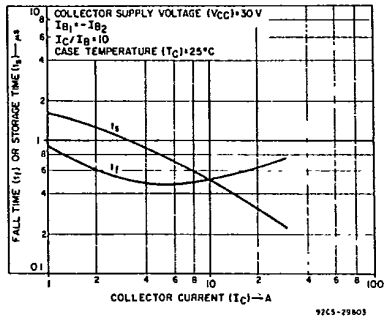


Fig. 7 – Typical storage-time and fall-time characteristics as a function of collector current for 2N5301, 2N5302, and 2N5303.

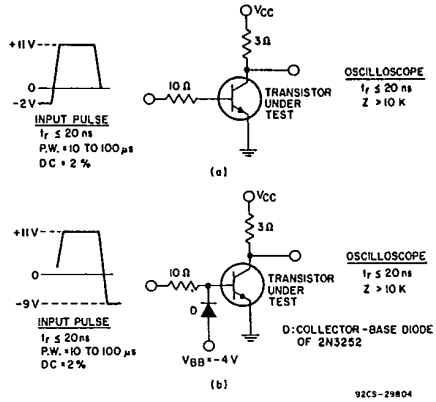


Fig. 8 – Equivalent test circuits for rise-time (a) and fall-time and storage-time (b) measurements for 2N5301, 2N5302, and 2N5303.