File Number 321

2N5239, 2N5240

High-Voltage, Silicon N-P-N Transistors

For High-Speed Switching and Linear-Amplifier Applications in Industrial and Commerical Service

Features:

- *High voltage ratings:* V_{CER}*[sus]*
  =350 V, $R_{BE} \leq 50\ \Omega$ *(2N5240)*
  =250 V, $R_{BE} \leq 50\ \Omega$ *(2N5239)*
- *High power dissipation rating:*
  $P_T = 100$ *W at* $V_{CE} = 125$ *V,* $T_C = 25°C$
- *For switching applications where circuit values and operating conditions require a transistor with a high second-breakdown rating* (I_S/b) *(limit line begins at 125 V)*
- *Exceptional second-breakdown: 0.8 A at* $V_{CE} = 125$ *V*
- *Maximum area-of-operation curves for dc and pulse operation*

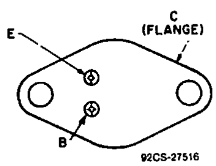
The RCA-2N5239 and 2N5240• are multi epitaxial silicon n-p-n power transistors.

The high breakdown voltage ratings and exceptional second-breakdown capabilities of these transistors make them especially suitable for use in series regulators, power amplifiers, inverters, deflection circuits, switching regulators, and high-voltage bridge amplifiers.

These types differ in breakdown voltage and leakage current values. The 2N5239 and 2N5240 are supplied in steel JEDEC TO-204AA hermetic packages.

• RCA Dev. No. TA2765 and TA2765A, respectively.

TERMINAL DESIGNATIONS



JEDEC TO-204AA

MAXIMUM RATINGS, *Absolute-Maximum Values:*

	2N5239	2N5240	
$^*V_{CBO}$	300	375	V
V_{CER}(sus) $R_{BE} \leq 50\ \Omega$	250	350	V
$^*V_{CEO}$(sus)	225	300	V
$^*V_{EBO}$	6		V
$^*I_C$	5		A
$^*I_B$	2		A
$^*P_T$:			
$T_C \leq 25°C$ and $V_{CE} \leq 125$ V	100		W
$T_C \leq 25°C$ and $V_{CE} \leq 125$ V	See Fig. 1		
$T_C > 25°C$ and $V_{CE} > 125$ V	See Fig. 1		
$^*T_{stg}, T_J$	-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

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ELECTRICAL CHARACTERISTICS, *At Case Temperature (Tc) = 25°C unless otherwise specified*

CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc		CURRENT A dc		2N5239		2N5240		
	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
* I_{CEO}	200			0	—	5	—	2	mA
* I_{CEV}	300	-1.5			—	4	—	—	mA
	375	-1.5			—	—	—	2	mA
(T_C = 150°C)	300	-1.5			—	5	—	3	mA
I_{EBO} (V_{EB} = 5 V)			0		—	5	—	1	mA
* (V_{EB} = 6 V)			0		—	20	—	20	mA
V_{EBO}				0.02	6	—	6	—	V
* $V_{CEO}(sus)$[a]			0.2[b]		225	—	300	—	V
$V_{CER}(sus)$[a] ($R_{BE} \leq 50\ \Omega$)			0.2[b]		250	—	350	—	V
* h_{FE}	10		0.4[b]		20	80	20	80	
*	10		2[b]		20	80	20	80	
	10		4.5[b]		5	—	5	—	
* V_{BE}	10		2[b]		—	3	—	3	V
* $V_{CE}(sat)$			2[b]	0.25	—	2.5	—	2.5	V
			4.5[b]	1.125	—	5	—	5	V
* $I_{S/b}$ (t = 1 s)	125				0.8	—	0.8	—	A
* $\lvert h_{fe} \rvert$ (f = 1 MHz)	10		0.2		2	—	2	—	
* h_{fe} (f = 1 kHz)	10		4		20	—	20	—	
f_T	10		0.2		2	—	2	—	MHz
C_{obo} (f = 1 MHz)	10[c]		0		—	250	—	250	pF
$R_{\theta JC}$					—	1.75	—	1.75	°C/W

* In accordance with JEDEC registration data.

[a] CAUTION: The sustaining voltages $V_{CEO}(sus)$ and $V_{CER}(sus)$ MUST NOT be measured on a curve tracer.

[b] Pulsed; pulse duration ≤ 350 μs, duty factory ≤ 2%.

[c] V_{CB} value.

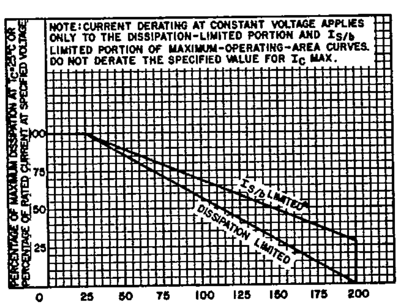

Fig. 1 – Derating curves for both types.

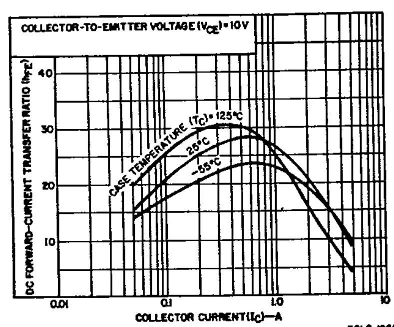

Fig. 2 — Typical dc beta characteristics for both types.

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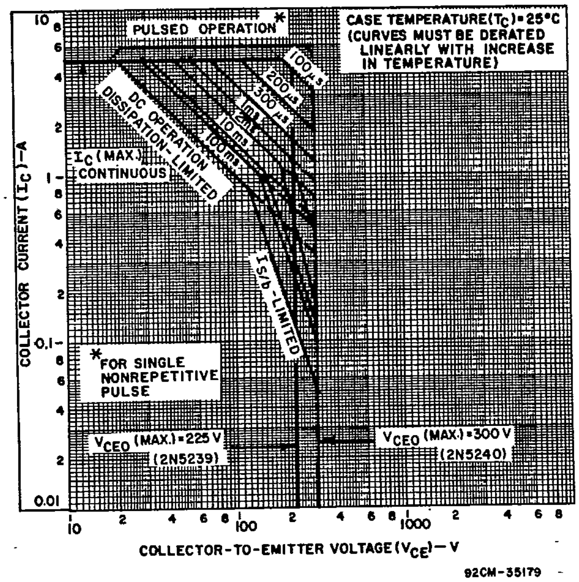

Fig. 3 - Maximum operating areas for both types.

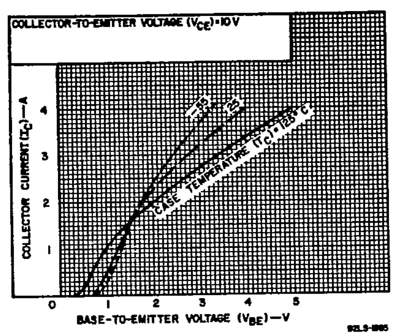

Fig. 4 — Typical transfer characteristics for both types.

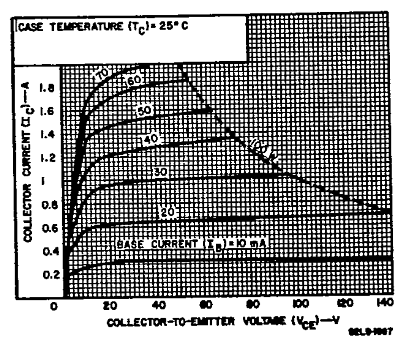

Fig. 5 — Typical output characteristics for both types.

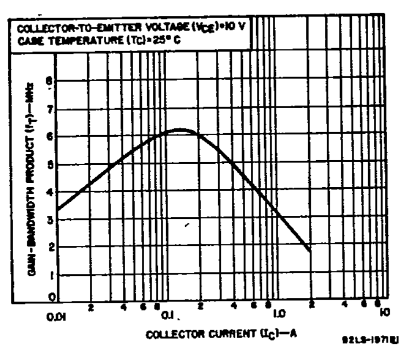

Fig. 6 — Typical gain-bandwidth product as a function of collector current for both types.

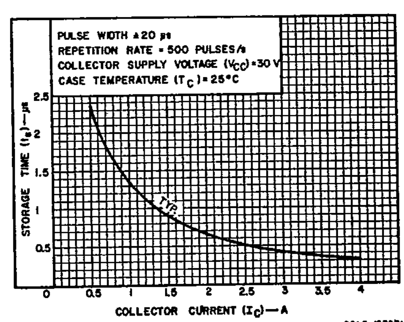

Fig. 7 — Typical saturated-switching time (storage) as a function of collector current for both types.

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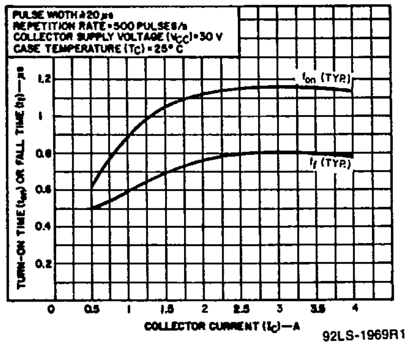

Fig. 8 — Typical saturated-time (turn-on or fall) as a function of collector current for both types.

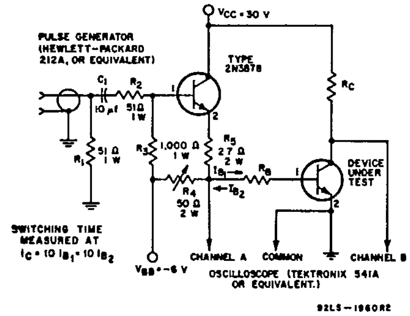

Fig. 9 — Circuit used to measure sustaining voltages, V_{CEO}(sus) and V_{CER}(sus) for both types.

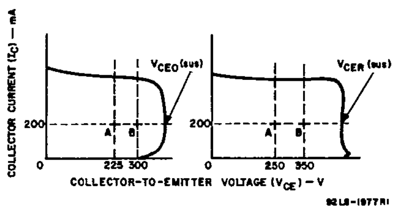

Fig. 10 — Oscilloscope display for V_{CEO}(sus) and V_{CER}(sus) measurement.

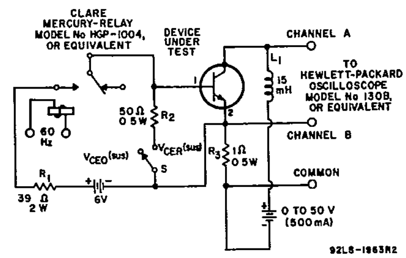

Fig. 11 — Circuit used to measure switching times for both types.

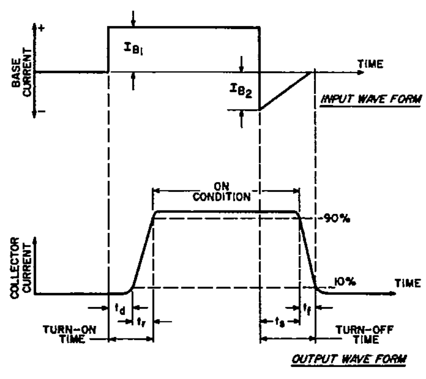

Fig. 12 — Phase relationship between input and output currents showing reference points for specification of switching times.