File Number **523**

2N6249, 2N6250, 2N6251

450-V, 30-A, 175-W
Silicon N-P-N Switching Transistors

For Switching Applications in Industrial and Commercial Equipment

Features:
- *High voltage ratings:*
  V_{CBO} = 450 V (2N6251)
  375 V (2N6250)
  300 V (2N6249)
- *High dissipation rating:*
  P_T = 175 W
- *Low saturation voltages*
- *Maximum safe-area-of-operation curves*

RCA-2N6249, 2N6250 and 2N6251 are multiple epitaxial silicon n-p-n power transistors. Multiple-epitaxial construction maximizes the volt-ampere characteristic of the device and provides fast switching speeds.

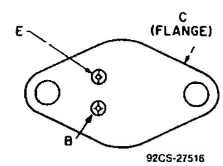
These devices use the popular JEDEC TO-204AA package; they differ mainly in voltage ratings, leakage-current limits, and V_{CE}(sat) ratings.

The exceptional second-breakdown capabilities and high voltage-breakdown ratings make these transistors especially suitable for offline inverters, switching regulators motor controls, and deflection circuit applications.

The high gain and high $E_{S/b}$ energy-handling capability of the 2N6249 make it an excellent choice for motor-control applications in which large winding inductances are encountered and high surge currents are required to start the motor.

The high breakdown voltages, low saturation voltages, and fast-switching capability of the 2N6250 and 2N6251 make them especially suitable for inverter circuits operating directly off the rectified 115-V power line or a bridge configuration operating from the rectified 220-V line.

TERMINAL DESIGNATIONS



JEDEC TO-213AA

MAXIMUM RATINGS, *Absolute-Maximum Values:*

	2N6249	2N6250	2N6251	
* V_{CBO}	300	375	450	V
V_{CEO}(sus)	200	275	350	V
* V_{CEX}(sus) (V_{BE} = 0 V)	225	300	375	V
V_{CER}(sus) (R_{BE}) ≤ 50 Ω	225	300	375	V
* V_{EBO}	6	6	6	V
* I_C	10	10	10	A
I_{CM}	30	30	30	A
* I_B	10	10	10	A
* P_T				
At T_C up to 25°C and V_{CE} up to 30 V	175	175	175	W
At T_C up to 25°C and V_{CE} above 30 V		Derate Linearly at 1		°C/W
* T_J, T_{stg}		-65 to +200		°C
* T_L				
At distances ≥ 1/32 in. (0.8 mm) from case for 10 s max.		230		°C

* 2N-Series types in accordance with JEDEC registration data format (JS-6, RDF-1).

2N6249, 2N6250, 2N6251

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

CHARACTERISTIC	TEST CONDITIONS DC VOLTAGE (V) V_{CE}	DC CURRENT (A) I_C	I_B	2N6249 MIN.	2N6249 TYP.	2N6249 MAX.	2N6250 MIN.	2N6250 TYP.	2N6250 MAX.	2N6251 MIN.	2N6251 TYP.	2N6251 MAX.	UNITS
I_{CEO}	150		0	–	–	5	–	–	–	–	–	–	mA
	225		0	–	–	–	–	–	5	–	–	–	
	300		0	–	–	–	–	–	–	–	–	5	
* I_{CEV} $V_{BE}=-1.5$	225			–	–	5	–	–	–	–	–	–	
	300			–	–	–	–	–	5	–	–	–	
	375			–	–	–	–	–	–	–	–	5	
* I_{CEV} $V_{BE}=-1.5$ $T_C=125°C$	225			–	–	10	–	–	–	–	–	–	
	300			–	–	–	–	–	10	–	–	–	
	375			–	–	–	–	–	–	–	–	10	
* I_{EBO} $V_{BE}=-6$				–	–	1	–	–	1	–	–	1	mA
* $V_{CEO}(sus)$		0.2		200[b]	–	–	275[b]	–	–	350[b]	–	–	V
$V_{CER}(sus)$ $R_{BE}=50\,\Omega$		0.2		225[b]	–	–	300[b]	–	–	375[b]	–	–	V
* V_{EBO} $I_E=1$ mA				6	–	–	6	–	–	6	–	–	V
* h_{FE}	3	10[a]		10	–	50	–	–	–	–	–	–	
	3	10[a]		–	–	–	8	–	50	–	–	–	
	3	10[a]		–	–	–	–	–	–	6	–	50	
* $V_{BE}(sat)$		10[a]	1	–	–	2.25	–	–	–	–	–	–	V
		10[a]	1.25	–	–	–	–	–	2.25	–	–	–	
		10[a]	1.67	–	–	–	–	–	–	–	–	2.25	
* $V_{CE}(sat)$		10[a]	1	–	–	1.5	–	–	–	–	–	–	V
		10[a]	1.25	–	–	–	–	–	1.5	–	–	–	
		10[a]	1.67	–	–	–	–	–	–	–	–	1.5	
* $\lvert h_{fe} \rvert$ f = 1 MHz	10	1		2.5	8	–	2.5	8	–	2.5	8	–	
* $I_{S/b}$ t_p = 1s nonrep.	30			5.8	–	–	5.8	–	–	5.8	–	–	A
* $E_{S/b}$ $V_{BE}=-4$ $R_B=50\,\Omega$, L = 50 µH		10[c]		2.5	–	–	2.5	–	–	2.5	–	–	mJ
* t_r $V_{CC}=200$ V, $I_{B1}=-I_{B2}$		10	1	–	0.8	2	–	–	–	–	–	–	µs
		10	1.25	–	–	–	–	0.8	2	–	–	–	
		10	1.67	–	–	–	–	–	–	–	0.8	2	
* t_s $V_{CC}=200$ V, $I_{B1}=-I_{B2}$		10	1	–	1.8	3.5	–	–	–	–	–	–	
		10	1.25	–	–	–	–	1.8	3.5	–	–	–	
		10	1.67	–	–	–	–	–	–	–	1.8	3.5	
* t_f $V_{CC}=200$ V, $I_{B1}=-I_{B2}$		10	1	–	0.5	1	–	–	–	–	–	–	
		10	1.25	–	–	–	–	0.5	1	–	–	–	
		10	1.67	–	–	–	–	–	–	–	0.5	1	
$R_{\theta JC}$	10	5		–	–	1	–	–	1	–	–	1	°C/W

* 2N-Series types in accordance with JEDEC registration data format (JS-6 RDF-1).
a Pulsed; pulse duration ≤300 µs, duty factor = 2%.
b CAUTION: The sustaining voltages $V_{CEO}(sus)$ and $V_{CER}(sus)$ MUST NOT be measured on a curve tracer.

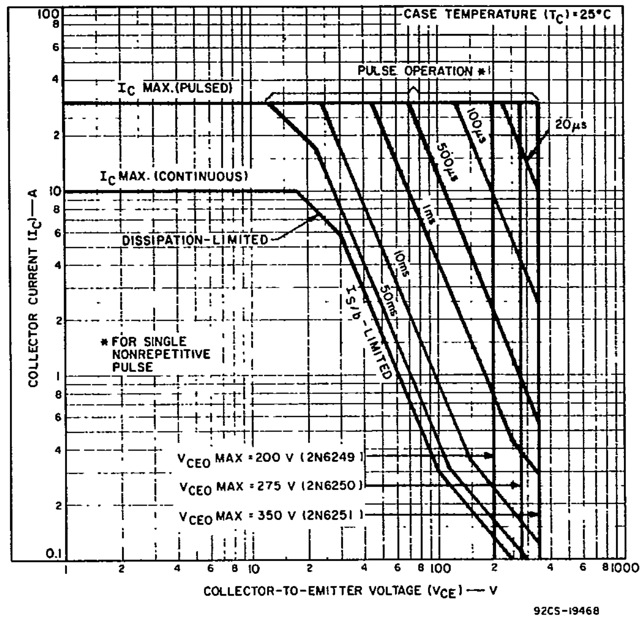


Fig. 1 - Maximum operating areas for all types at T_C = 25° C.

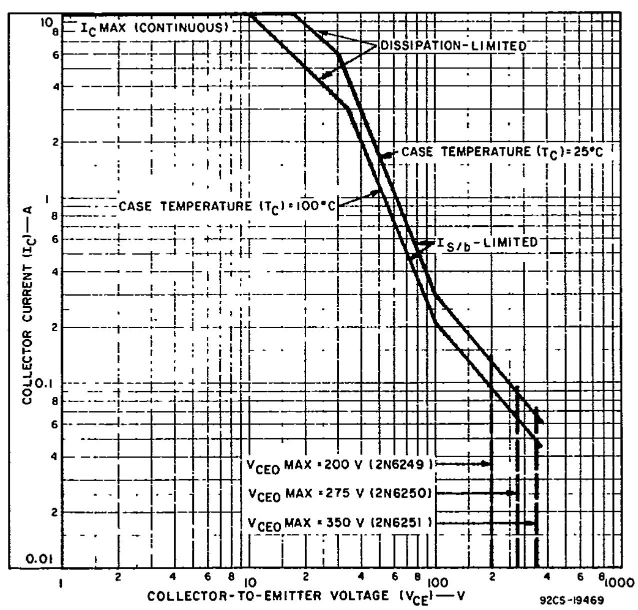


Fig. 2 - Maximum operating areas for all types at T_C = 100° C.

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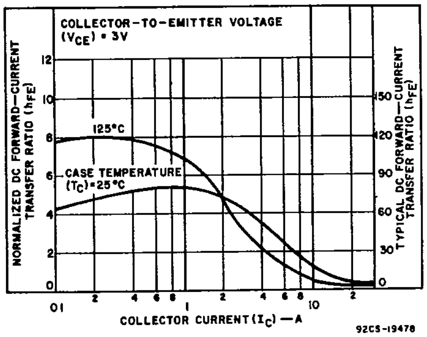

Fig. 3 - Typical normalized dc beta characteristics for all types.

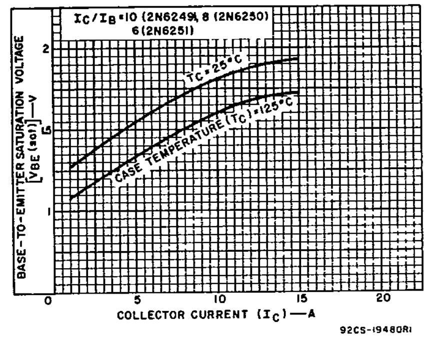

Fig. 4 - Typical base-to-emitter saturation voltage characteristics for all types.

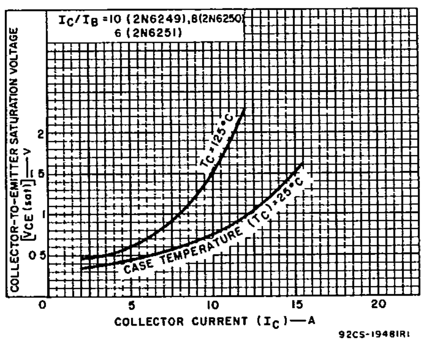

Fig. 5 - Typical collector-to-emitter saturation voltage characteristics for all types.

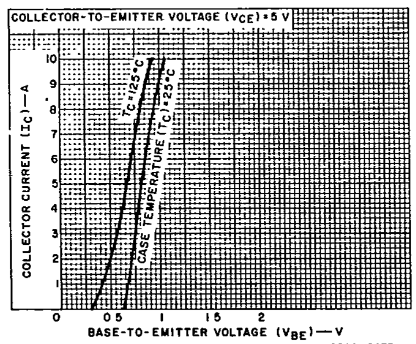

Fig. 6 - Typical transfer characteristics for all types.

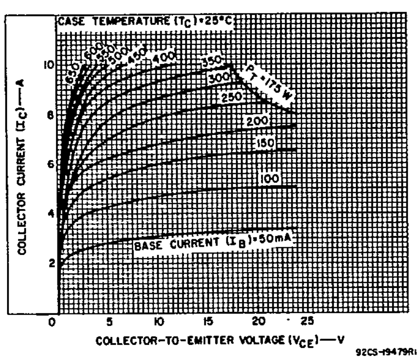

Fig. 7 - Typical output characteristics for all types.

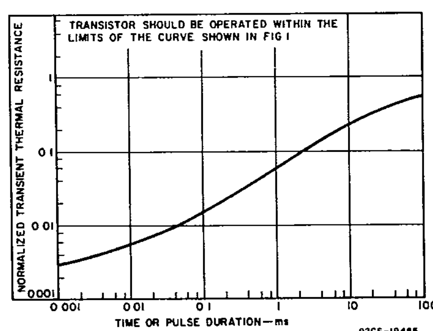

Fig. 8 - Typical thermal response characteristics for all types.

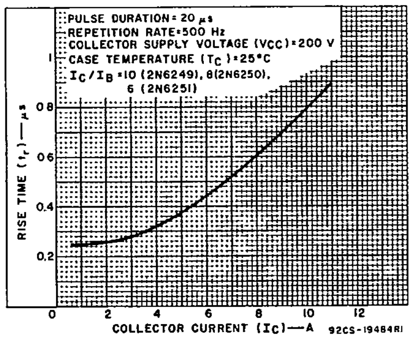

Fig. 9 - Typical rise-time characteristics for all types.

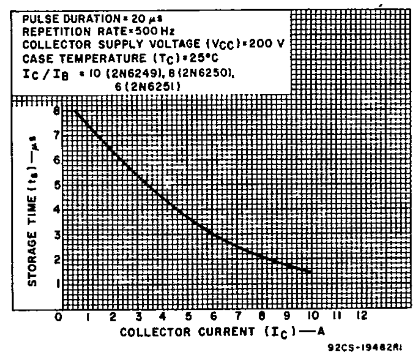

Fig. 10 - Typical storage-time characteristics for all types (with constant forced gain).

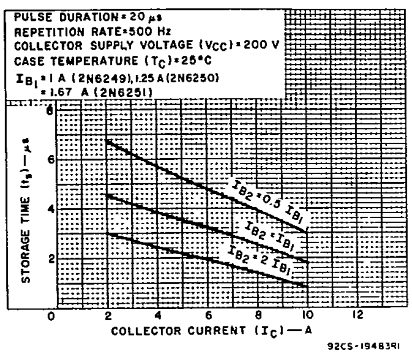

Fig. 11 - Typical storage-time characteristics for all types (with constant base drive).

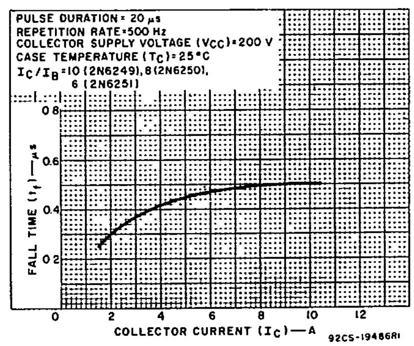

Fig. 12 - Typical fall-time characteristic for all types.

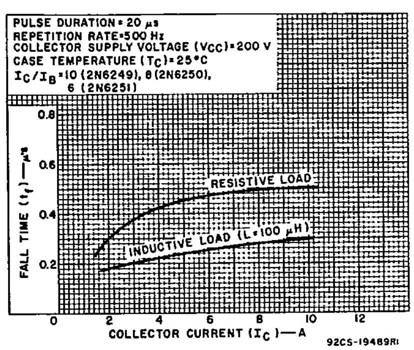

Fig. 13 - Typical inductive- and resistive-load fall-time characteristics for all types.

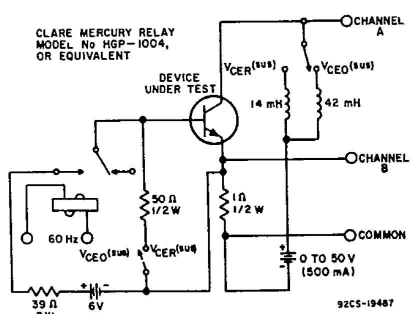

Fig. 14 - Circuit used to measure sustaining voltage $V_{CEO}(sus)$ and $V_{CER}(sus)$ for all types.

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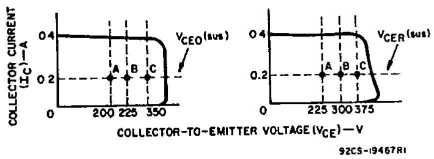

The sustaining voltages V_{CEO}(sus) and V_{CER}(sus) are acceptable when the traces fall to the right of point "A" for type 2N6249, point "B" for type 2N6250, and point "C" for type 2N6251 (I_C = 0.2 A).

Fig. 15 - Oscilloscope display for measurement of sustaining voltages.

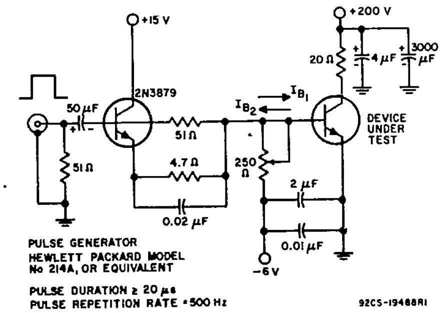

Fig. 16 - Circuit used to measure switching times for all types.

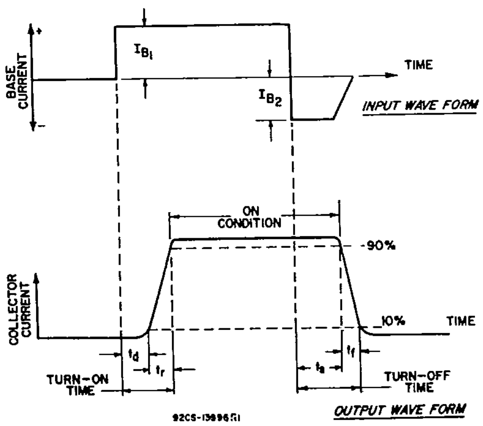

Fig. 17 - Phase relationship between input and output currents showing reference points for specifications of switching times.

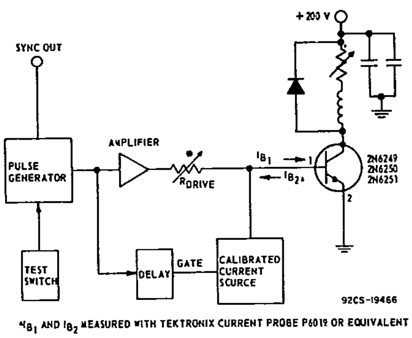

Fig. 18 - Circuit used to measure inductive-load switching times for all types.