

File Number 216

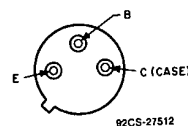
2N4036, 2N4037, 2N4314

**Medium-Power Silicon
P-N-P Planar Transistors**General-Purpose Types for Industrial and
Commercial Applications**Features:**

- Gain-bandwidth product (f_T) = 60 MHz min.
- High breakdown voltages
- Planar construction provides low noise and low leakage
- Low saturation voltages
- High pulsed beta at high collector current

The 2N4036, 2N4037, and 2N4314 are doubled-diffused, epitaxial-planar, silicon p-n-p transistors; they differ in breakdown-voltage ratings, leakage-current, and saturation characteristics. They are supplied in the JEDEC TO-205AD hermetic package.

These transistors are intended for a wide variety of small-signal medium-power applications. With a minimum gain-bandwidth product (f_T) of 60 MHz, these devices provide useful gain at high frequencies. In addition, the 2N4036 is useful in high-speed saturated switching applications.

TERMINAL DESIGNATIONS

JEDEC TO-205AD

MAXIMUM RATINGS, Absolute-Maximum Values:

	2N4036	2N4037	2N4314	
* V_{CE0}	-90	-60	-90	V
$V_{CEV(SUS)}$ $V_{BE} = +1.5$ V	-85	-60	-85	V
$V_{CEV(SUS)}$ $R_{BE} \leq 200 \Omega$	-85	-60	-85	V
* $V_{CE0(SUS)}$	-65	-40	-65	V
* V_{EBO}	-7	-7	-7	V
* I_C	-1.0	-1.0	-1.0	A
* I_B	-0.5	-0.5	-0.5	A
* P_T : $T_C \leq 25^\circ\text{C}$	7	7	7	W
$T_C, T_A > 25^\circ\text{C}$	—	1	—	W
Pulsed	—	See Fig. 2	—	$^\circ\text{C}$
* T_{stg}, T_J	—	See Fig. 1	—	$^\circ\text{C}$
* T_L (During soldering): At distance $\geq 1/16$ in. (1.58 mm) from seating plane for 10 s max.	—	-65 to 200	—	$^\circ\text{C}$

* In accordance with JEDEC registration data format (JS-6 RDF-1 2N4036; JS-9 RDF-2 2N4037, 2N4314).

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

CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
	VOLTAGE V dc		CURRENT mA dc		2N4036		2N4037		2N4314		
	V _{CE}	V _{BE}	I _C	I _B	Min.	Max.	Min.	Max.	Min.	Max.	
I _{CBO} I _E = 0	-90*				—	-0.1*	—	—	—	—	mA
	-60*				—	-0.02	—	-0.25*	—	-0.25*	μA
I _{CEO}	-30			0	—	-0.5*	—	-5*	—	-5*	μA
I _{CEX} T _C = 150°C	-85	1.5			—	-100*	—	—	—	—	mA
	-30	1.5			—	-0.1*	—	—	—	—	mA
I _{EBO}		7	0		—	-0.1*	—	—	—	—	mA
		5	0		—	-0.02	—	-1*	—	-1*	μA
V _{(BR)CBO} I _E = 0			-0.1		-90	—	-60*	—	-90*	—	V
V _{(BR)EBO} I _E = -0.1 mA			0	—	-7	—	-7	—	-7	—	V
V _{CEV(sus)}		1.5	-100		-85 ^b	—	-60 ^b	—	-85 ^b	—	V
V _{CER(sus)} R _{BE} ≤ 200 Ω			-100		-85 ^b	—	-60 ^b	—	-85 ^b	—	V
V _{CEO(sus)}			-100	0	-65 ^b	—	-40 ^b	—	-65 ^b	—	V
V _{CE(sat)}			-150	-15	—	-0.65	—	-1.4	—	-1.4	V
V _{BE}	-10		-150		—	-1.1	—	-1.5*	—	-1.5*	V
V _{BE(sat)}			-150	-15	—	-1.4	—	—	—	—	V
h _{FE}	-2 -10 -10 -10 -10		-150 -0.1 -1.0 -150 ^a -500 ^a	20 20 — 40 20	200 — — 140 —	— — 15 50 —	— — — 250 —	— — 15 50 —	— — — 250 —	— — — — —	
h _{fe} f = 20 MHz	-10		-50		3	—	3	10	3	10	
C _{cb} I _E = 0, f = 1 MHz	-10*				—	30	—	30*	—	30*	pF
C _{ib}		0.5	0		—	90	—	90	—	90	pF
t _r	-30		-150	-15	—	70	—	—	—	—	ns
t _s	-30		-150	-15	—	600	—	—	—	—	
t _f	-30		-150	-15	—	100	—	—	—	—	
t _{ON}	-30		-150	-15	—	110	—	—	—	—	
t _{OFF}	-30		-150	-15	—	700	—	—	—	—	
R _{θJC}					—	25*	—	25	—	25	°C/W
R _{θJA}					—	165	—	165	—	165	°C/W

* "2N"-types in accordance with JEDEC registration data format (JS-6 RDF-1 2N4036; JS-9 RDF-2 2N4037, 2N4314).

• V_{CB}

a Pulsed, pulse duration = 300 μ s, duty factor < 2%.

b CAUTION: The sustaining voltages $V_{CEO(sus)}$, $V_{CER(sus)}$, and $V_{CEV(sus)}$ MUST NOT be measured on a curve tracer. They should be measured by the pulse method (Note 'a').

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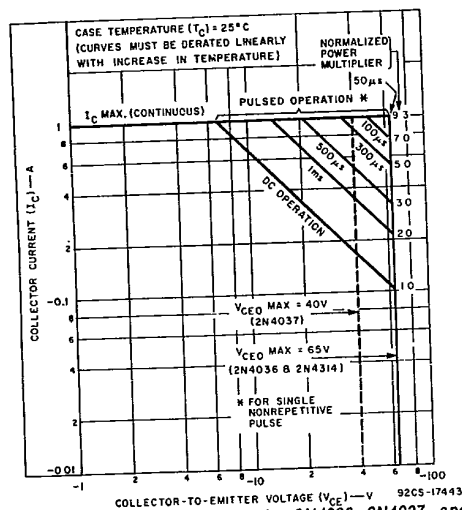


Fig. 1 - Maximum operating areas for 2N4036, 2N4037, and 2N4314.

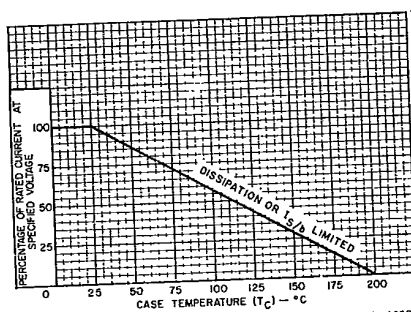


Fig. 2 - Dissipation derating curve for 2N4036, 2N4037, and 2N4314.

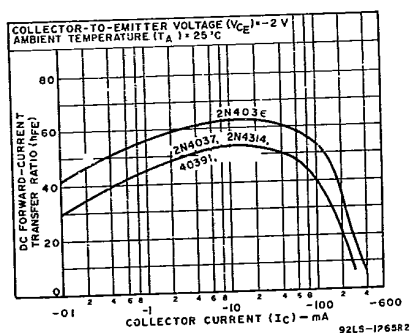


Fig. 3 - Typical dc beta characteristics for all types.

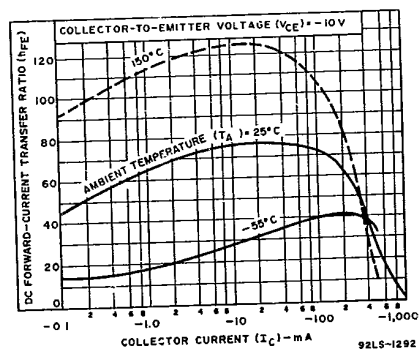


Fig. 4 - Typical dc beta characteristics for 2N4037 and 2N4314.

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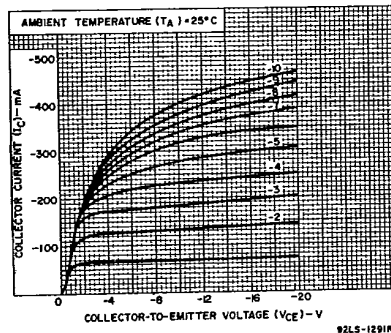


Fig. 5 - Typical large-signal output characteristics for 2N4037 and 2N4314.

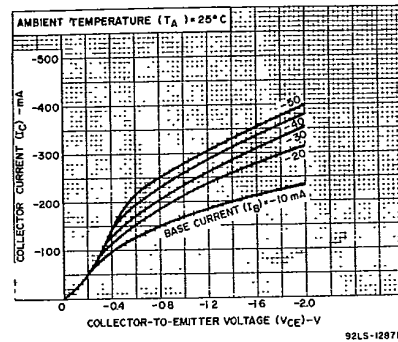


Fig. 6 - Typical small-signal output characteristics for 2N4037 and 2N4314.

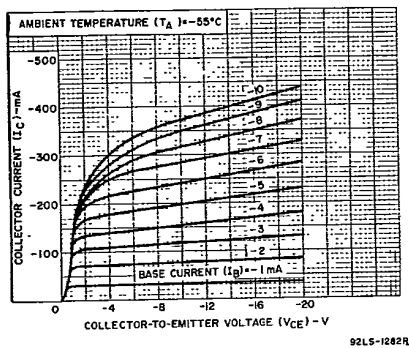


Fig. 7 - Typical output characteristics at $T_A = -55^\circ\text{C}$ for 2N4037 and 2N4314.

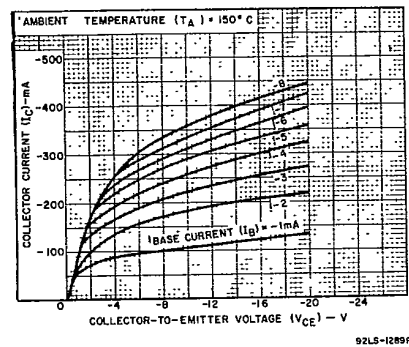


Fig. 8 - Typical output characteristics at $T_A = 150^\circ\text{C}$ for 2N4037 and 2N4314.

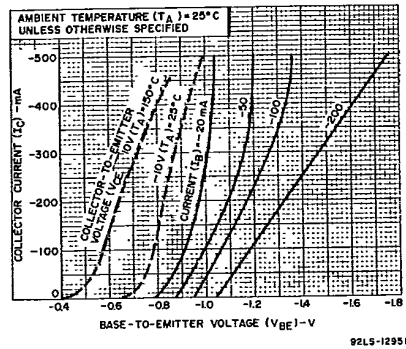


Fig. 9 - Typical transfer characteristics for 2N4037 and 2N4314.

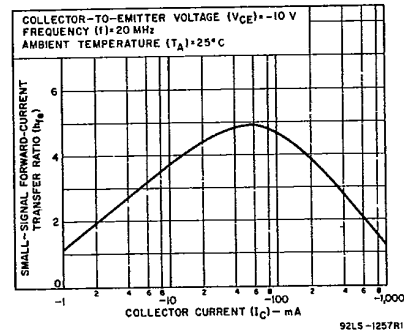


Fig. 10 - Typical small-signal beta characteristic for all types.

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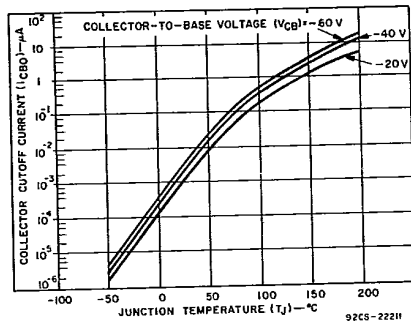


Fig. 11 - Typical collector cutoff current vs. junction temperature for 2N4036.

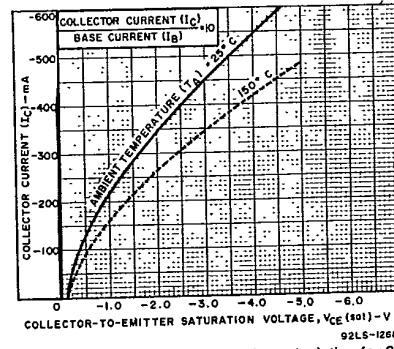


Fig. 12 - Typical saturation-voltage characteristics for 2N4036.

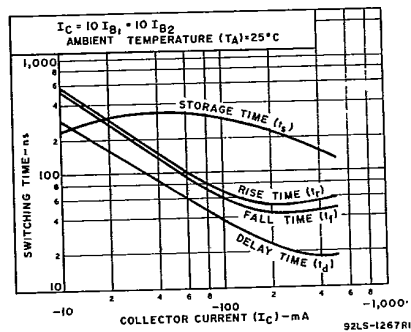


Fig. 13 - Typical saturated switching times for type 2N4036.

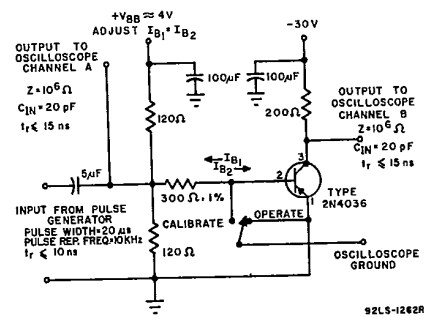


Fig. 14 - Circuit used to measure switching times for type 2N4036.

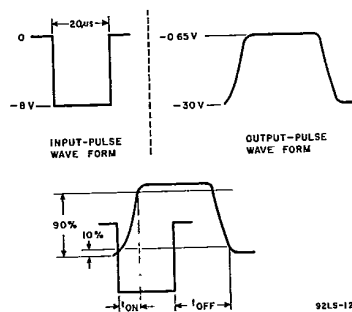


Fig. 15 - Oscilloscope display for measurement of switching times.