

File Number 216

2N4036, 2N4037, 2N4314

Medium-Power Silicon P-N-P Planar Transistors

General-Purpose Types for Industrial and Commercial Applications

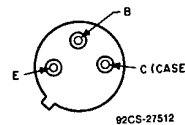
Features:

- 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 _{CEO}	-90	-60	-90	V
V _{CEV(SUS)} V _{BE} = +1.5 V	-85	-60	-85	V
V _{CEV(SUS)} R _{BE} ≤ 200 Ω	-85	-60	-85	V
*V _{CEO(SUS)}	-65	-40	-65	V
*V _{EB0}	-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 ≤ 25°C	7	7	7	W
	—	1	—	W
T _C , T _A > 25°C		See Fig. 2		°C
Pulsed		See Fig. 1		°C
*T _{stg} , T _J		-65 to 200		°C
*T _L (During soldering): At distance ≥ 1/16 in. (1.58 mm) from seating plane for 10 s max.		230		°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}	-85	1.5			-	-100*	-	-	-	-	mA
T _C = 150°C	-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		-150		20	200	-	-	-	-	
	-10		-0.1		20	-	-	-	-	-	
	-10		-1.0		-	-	15	-	15	-	
	-10		-150 ^a		40	140	50	250	50	250	
	-10		-500 ^a		20	-	-	-	-	-	
h _{fe1} 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	-	-	-	-	
t _s	-30		-150	-15	-	600	-	-	-	-	
t _f	-30		-150	-15	-	100	-	-	-	-	ns
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 μs, 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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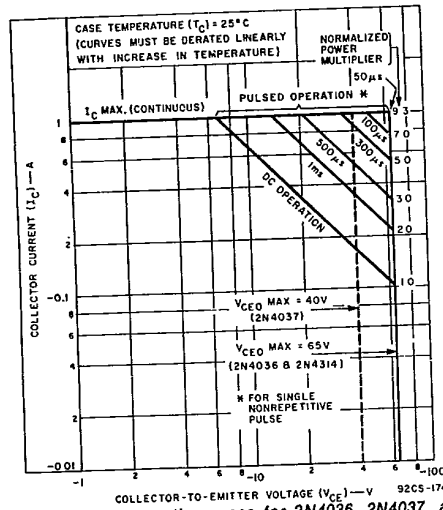


Fig. 1 - Maximum operating areas for 2N4036, 2N4037, and 2N4314.

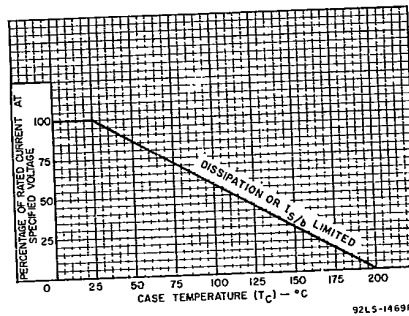


Fig. 2 - Dissipation derating curve for 2N4036, 2N4037, and 2N4314.

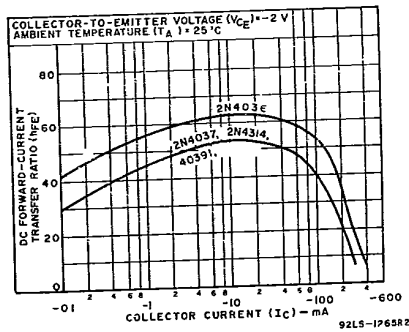


Fig. 3 - Typical dc beta characteristics for all types.

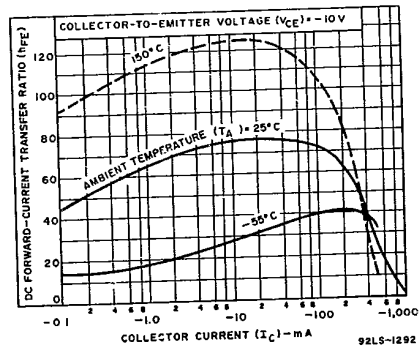


Fig. 4 - Typical dc beta characteristics for 2N4037 and 2N4314.

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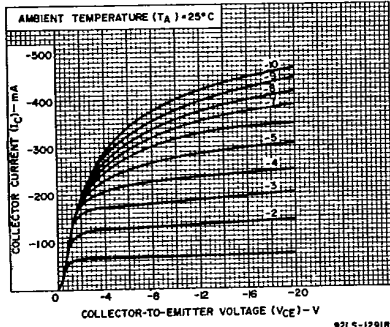


Fig. 5 - Typical large-signal output characteristics for 2N4037 and 2N4314.

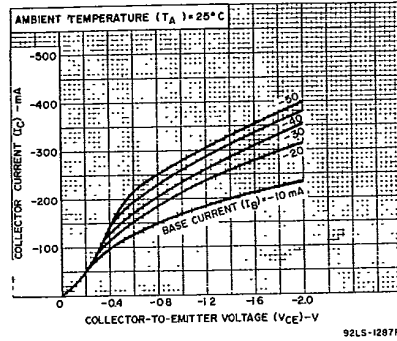


Fig. 6 - Typical small-signal output characteristics for 2N4037 and 2N4314.

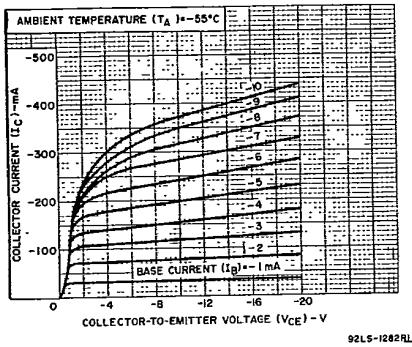


Fig. 7 - Typical output characteristics at $T_A = -55^\circ\text{C}$ for 2N4037 and 2N4314.

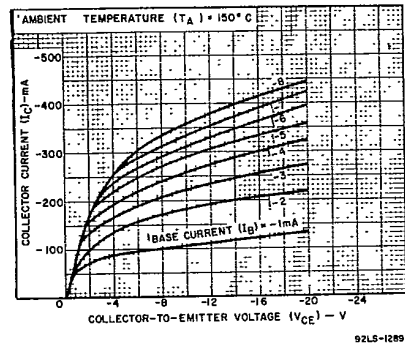


Fig. 8 - Typical output characteristics at $T_A = 150^\circ\text{C}$ for 2N4037 and 2N4314.

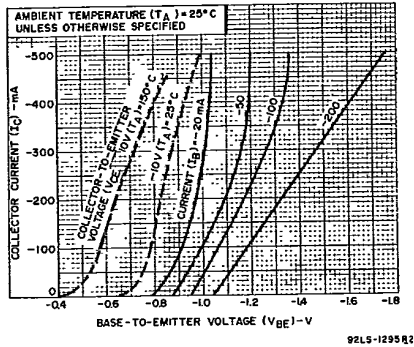


Fig. 9 - Typical transfer characteristics for 2N4037 and 2N4314.

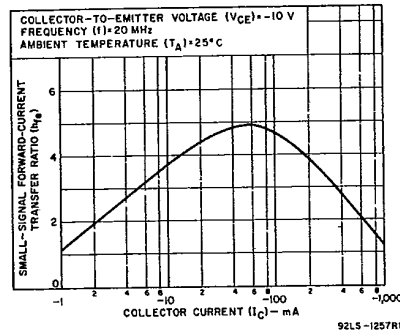


Fig. 10 - Typical small-signal beta characteristic for all types.

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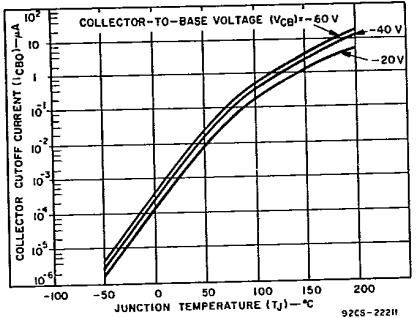


Fig. 11 - Typical collector cutoff current vs. junction temperature for 2N4036.

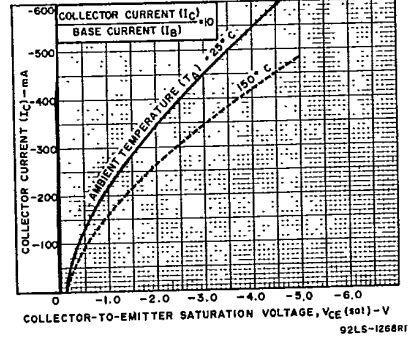


Fig. 12 - Typical saturation-voltage characteristics for 2N4036.

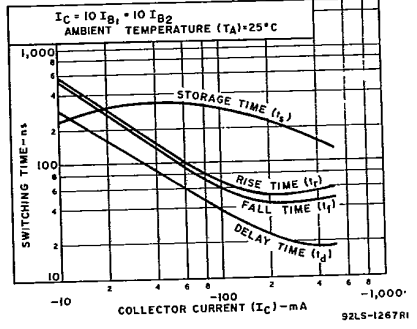


Fig. 13 - Typical saturated switching times for type 2N4036.

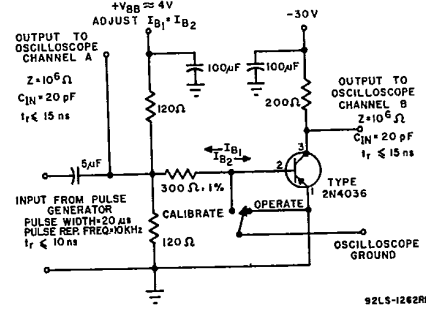


Fig. 14 - Circuit used to measure switching times for type 2N4036.

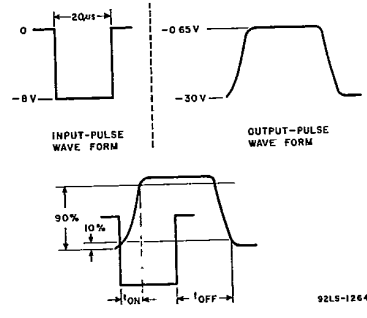


Fig. 15 - Oscilloscope display for measurement of switching times.