

File Number 216

2N4036, 2N4037, 2N4314

Medium-Power Silicon P-N-P Planar Transistors

General-Purpose Types for Industrial and Commercial Applications

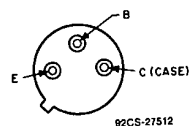
Features:

- 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

PDF Support

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 _r : 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).

2N4036, 2N4037, 2N4314

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').

2N4036, 2N4037, 2N4314

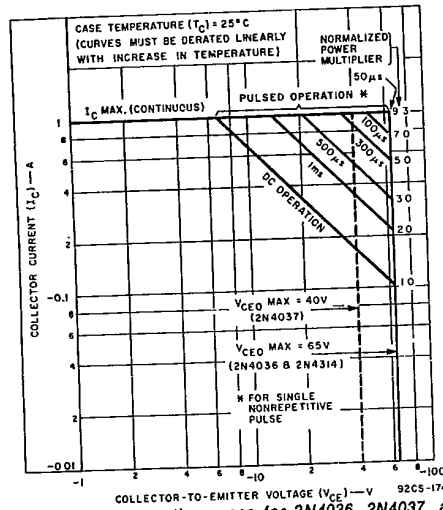


Fig. 1 - Maximum operating areas for 2N4036, 2N4037, and 2N4314.

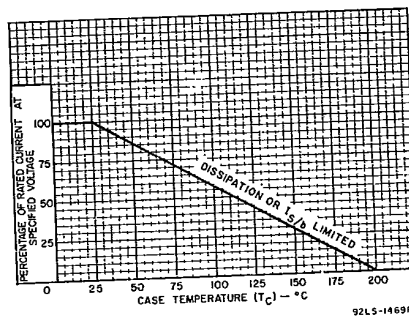


Fig. 2 - Dissipation derating curve for 2N4036, 2N4037, and 2N4314.

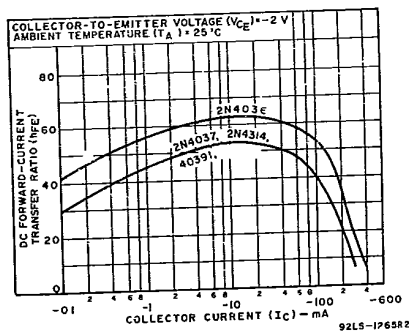


Fig. 3 - Typical dc beta characteristics for all types.

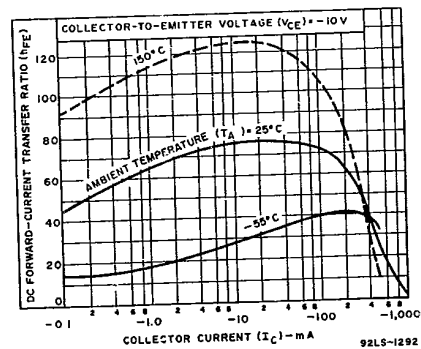


Fig. 4 - Typical dc beta characteristics for 2N4037 and 2N4314.

2N4036, 2N4037, 2N4314

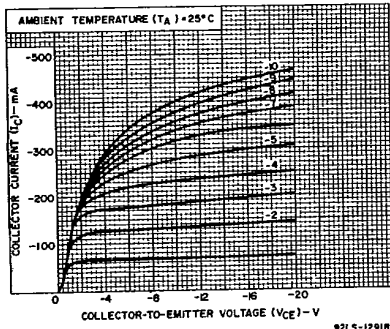


Fig. 5 - Typical large-signal output characteristics for 2N4037 and 2N4314.

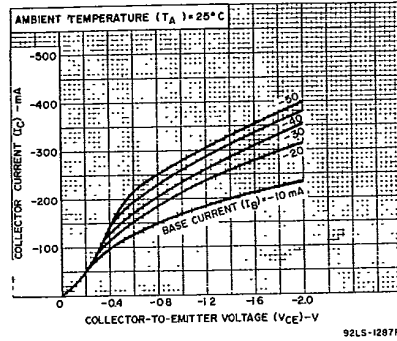


Fig. 6 - Typical small-signal output characteristics for 2N4037 and 2N4314.

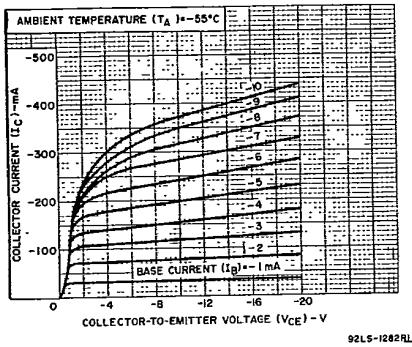


Fig. 7 - Typical output characteristics at T_A = -55°C for 2N4037 and 2N4314.

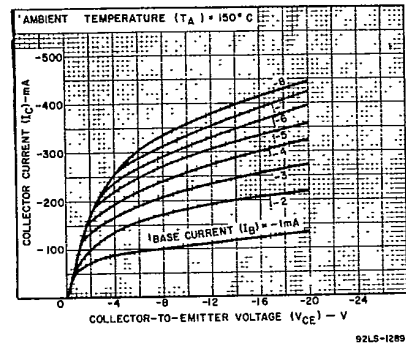


Fig. 8 - Typical output characteristics at T_A = 150°C for 2N4037 and 2N4314.

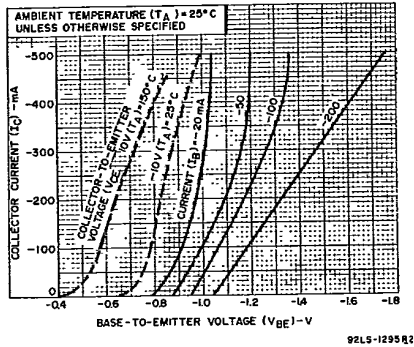


Fig. 9 - Typical transfer characteristics for 2N4037 and 2N4314.

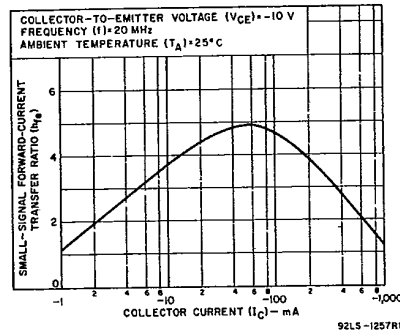


Fig. 10 - Typical small-signal beta characteristic for all types.

2N4036, 2N4037, 2N4314

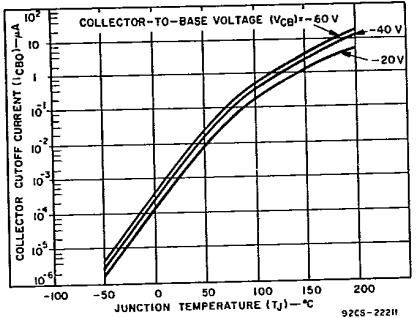


Fig. 11 - Typical collector cutoff current vs. junction temperature for 2N4036.

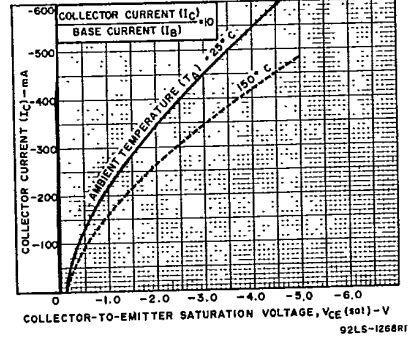


Fig. 12 - Typical saturation-voltage characteristics for 2N4036.

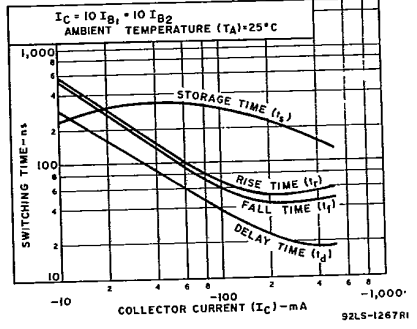


Fig. 13 - Typical saturated switching times for type 2N4036.

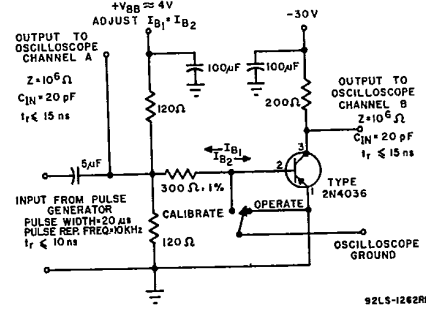


Fig. 14 - Circuit used to measure switching times for type 2N4036.

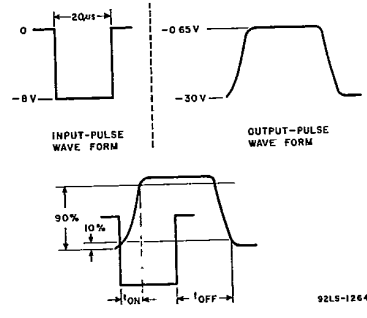


Fig. 15 - Oscilloscope display for measurement of switching times.