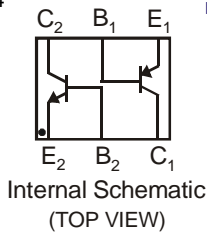


Features

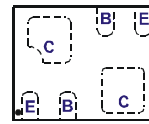
- Complementary Pair: One 3904 (NPN) and One 3906 (PNP)
- Epitaxial Planar Die Construction
- Ideally Suited for Automated Assembly Processes
- **Lead Free by Design/RoHS Compliant (Note 1)**
- **“Green” Device (Note 2)**

Mechanical Data

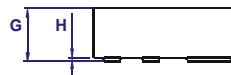
- Case: DFN1310H4-6
- Case Material: Molded Plastic. “Green Molding” Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Finish – NiPdAu over Copper leadframe (Lead Free Plating) Solderable per MIL-STD-202, Method 208
- Marking & Type Code Information: See Page 4
- Ordering Information: See Page 4



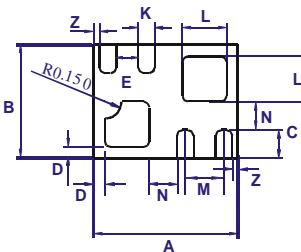
E₁, B₁, C₁ = PNP3906 Section
E₂, B₂, C₂ = NPN3904 Section



Top View



Side View



Bottom View

| DFN1310H4-6 | | | |
|-------------|------|------|------|
| Dim | Min | Max | Typ |
| A | 1.25 | 1.38 | 1.30 |
| B | 0.95 | 1.08 | 1.00 |
| C | 0.20 | 0.30 | 0.25 |
| D* | - | - | 0.10 |
| E** | - | - | 0.20 |
| G | - | 0.40 | - |
| H | 0 | 0.05 | 0.02 |
| K* | 0.10 | 0.20 | 0.15 |
| L* | 0.30 | 0.50 | 0.40 |
| M** | - | - | 0.35 |
| N* | - | - | 0.25 |
| Z** | - | - | 0.05 |

All Dimensions in mm

* Dimensions D, K, L, N Repeat 4X
** Dimensions E, M, Z Repeat 2X

Maximum Ratings, NPN 3904 Section @T_A = 25°C unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|--|------------------|-------|------|
| Collector-Base Voltage | V _{CB0} | 60 | V |
| Collector-Emitter Voltage | V _{CEO} | 40 | V |
| Emitter-Base Voltage | V _{EBO} | 6.0 | V |
| Collector Current – Continuous | I _c | 200 | mA |
| Power Dissipation (Notes 3, 4) | P _d | 200 | mW |
| Thermal Resistance, Junction to Ambient (Note 3) | R _{θJA} | 625 | °C/W |

Maximum Ratings, PNP 3906 Section @T_A = 25°C unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|--|------------------|-------|------|
| Collector-Base Voltage | V _{CB0} | -40 | V |
| Collector-Emitter Voltage | V _{CEO} | -40 | V |
| Emitter-Base Voltage | V _{EBO} | -5.0 | V |
| Collector Current - Continuous (Note 1) | I _c | -200 | mA |
| Power Dissipation (Notes 3, 4) | P _d | 200 | mW |
| Thermal Resistance, Junction to Ambient (Note 3) | R _{θJA} | 625 | °C/W |

- Notes:
1. No purposefully added lead.
 2. Diodes Inc.'s “Green” policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
 3. Device mounted on FR-4 PCB.
 4. Maximum combined dissipation.

Electrical Characteristics, NPN 3904 Section @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic | Symbol | Min | Max | Unit | Test Condition |
|--------------------------------------|---------------|-----------|--------------|------|--|
| OFF CHARACTERISTICS (Note 5) | | | | | |
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | 60 | — | V | $I_C = 10\mu\text{A}, I_E = 0$ |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | 40 | — | V | $I_C = 1.0\text{mA}, I_B = 0$ |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | 6.0 | — | V | $I_E = 10\mu\text{A}, I_C = 0$ |
| Collector Cutoff Current | I_{CEX} | — | 50 | nA | $V_{CE} = 30\text{V}, V_{EB(OFF)} = 3.0\text{V}$ |
| Base Cutoff Current | I_{BL} | — | 50 | nA | $V_{CE} = 30\text{V}, V_{EB(OFF)} = 3.0\text{V}$ |
| ON CHARACTERISTICS (Note 5) | | | | | |
| DC Current Gain | h_{FE} | 40 | — | — | $I_C = 100\mu\text{A}, V_{CE} = 1.0\text{V}$ |
| | | 70 | — | | |
| | | 100 | 300 | | |
| | | 60 | — | | |
| | | 30 | — | | |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | 0.20 0.30 | V | $I_C = 10\text{mA}, I_B = 1.0\text{mA}$ $I_C = 50\text{mA}, I_B = 5.0\text{mA}$ |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | 0.65 — | 0.85 0.95 | V | $I_C = 10\text{mA}, I_B = 1.0\text{mA}$ $I_C = 50\text{mA}, I_B = 5.0\text{mA}$ |
| SMALL SIGNAL CHARACTERISTICS | | | | | |
| Output Capacitance | C_{obo} | — | 4.0 | pF | $V_{CB} = 5.0\text{V}, f = 1.0\text{MHz}, I_E = 0$ |
| Current Gain-Bandwidth Product | f_T | 300 | — | MHz | $V_{CE} = 20\text{V}, I_C = 20\text{mA}, f = 100\text{MHz}$ |
| SWITCHING CHARACTERISTICS | | | | | |
| Delay Time | t_d | — | 35 | ns | $V_{CC} = 3.0\text{V}, I_C = 10\text{mA}$ |
| Rise Time | t_r | — | 35 | ns | $V_{BE(off)} = -0.5\text{V}, I_{B1} = 1.0\text{mA}$ |
| Storage Time | t_s | — | 200 | ns | $V_{CC} = 3.0\text{V}, I_C = 10\text{mA}$ |
| Fall Time | t_f | — | 50 | ns | $I_{B1} = I_{B2} = 1.0\text{mA}$ |

Electrical Characteristics, PNP 3906 Section @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic | Symbol | Min | Max | Unit | Test Condition |
|--------------------------------------|---------------|------------|----------------|------|--|
| OFF CHARACTERISTICS (Note 5) | | | | | |
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | -40 | — | V | $I_C = -10\mu\text{A}, I_E = 0$ |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | -40 | — | V | $I_C = -1.0\text{mA}, I_B = 0$ |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | -5.0 | — | V | $I_E = -10\mu\text{A}, I_C = 0$ |
| Collector Cutoff Current | I_{CEX} | — | -50 | nA | $V_{CE} = -30\text{V}, V_{EB(OFF)} = -3.0\text{V}$ |
| Base Cutoff Current | I_{BL} | — | -50 | nA | $V_{CE} = -30\text{V}, V_{EB(OFF)} = -3.0\text{V}$ |
| ON CHARACTERISTICS (Note 5) | | | | | |
| DC Current Gain | h_{FE} | 60 | — | — | $I_C = -100\mu\text{A}, V_{CE} = -1.0\text{V}$ |
| | | 80 | — | | |
| | | 100 | 300 | | |
| | | 60 | — | | |
| | | 30 | — | | |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | -0.25 -0.40 | V | $I_C = -10\text{mA}, I_B = -1.0\text{mA}$ $I_C = -50\text{mA}, I_B = -5.0\text{mA}$ |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | -0.65 — | -0.85 -0.95 | V | $I_C = -10\text{mA}, I_B = -1.0\text{mA}$ $I_C = -50\text{mA}, I_B = -5.0\text{mA}$ |
| SMALL SIGNAL CHARACTERISTICS | | | | | |
| Output Capacitance | C_{obo} | — | 4.5 | pF | $V_{CB} = -5.0\text{V}, f = 1.0\text{MHz}, I_E = 0$ |
| Current Gain-Bandwidth Product | f_T | 250 | — | MHz | $V_{CE} = -20\text{V}, I_C = -10\text{mA}, f = 100\text{MHz}$ |
| SWITCHING CHARACTERISTICS | | | | | |
| Delay Time | t_d | — | 35 | ns | $V_{CC} = -3.0\text{V}, I_C = -10\text{mA}$ |
| Rise Time | t_r | — | 35 | ns | $V_{BE(off)} = 0.5\text{V}, I_{B1} = -1.0\text{mA}$ |
| Storage Time | t_s | — | 225 | ns | $V_{CC} = -3.0\text{V}, I_C = -10\text{mA}$ |
| Fall Time | t_f | — | 75 | ns | $I_{B1} = I_{B2} = -1.0\text{mA}$ |

Notes: 5. Short duration test pulse used to minimize self-heating effect.

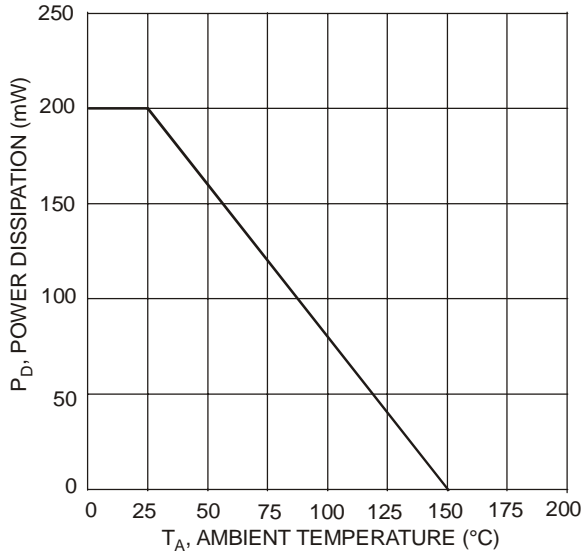


Fig. 1, Max Power Dissipation vs Ambient Temperature (Total Device) (Note 3)

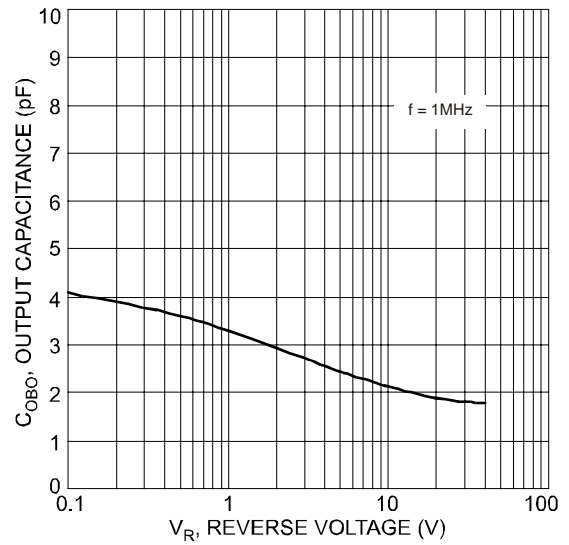


Fig. 2, Typical Output Capacitance Characteristics (NPN-3904)

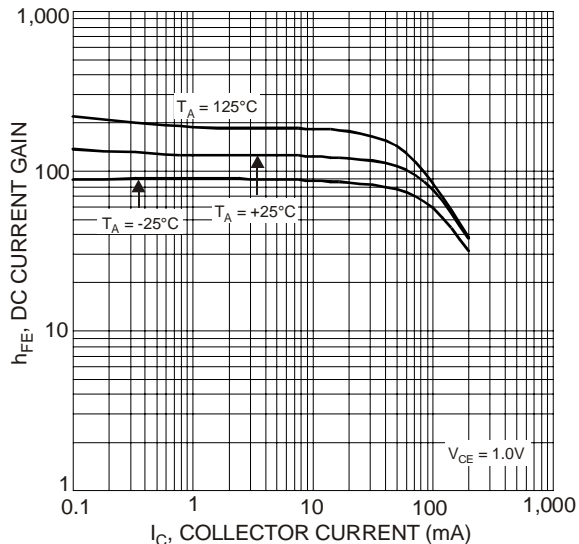


Fig. 3, Typical DC Current Gain vs Collector Current (NPN-3904)

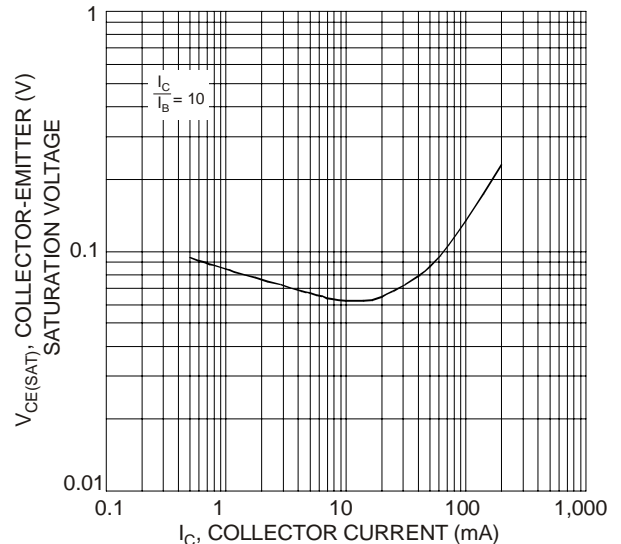


Fig. 4, Typical Collector-Emitter Saturation Voltage vs. Collector Current (NPN-3904)

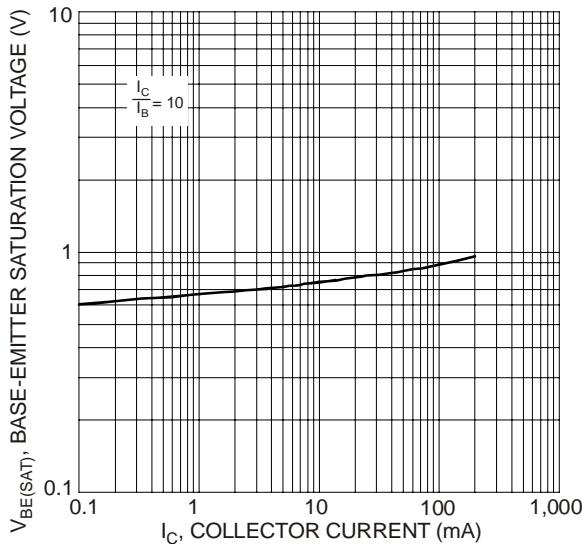


Fig. 5, Typical Base-Emitter Saturation Voltage vs. Collector Current (NPN-3904)

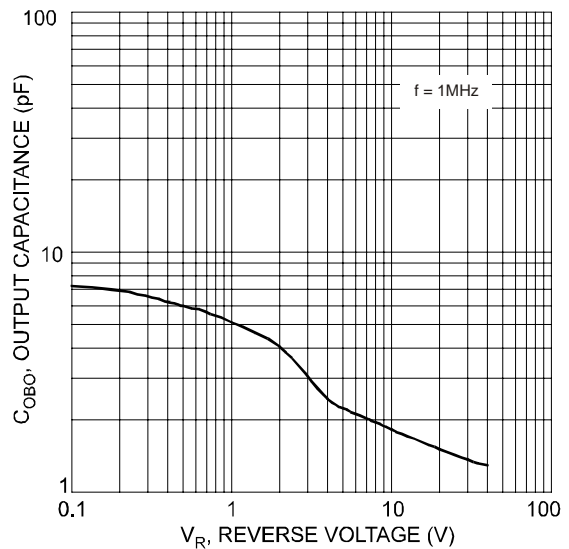


Fig. 6, Typical Output Capacitance Characteristics (PNP-3906)

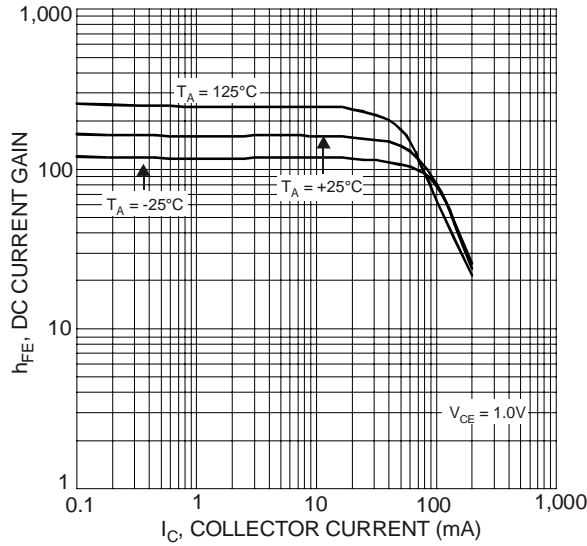


Fig. 7, Typical DC Current Gain vs Collector Current (PNP-3906)

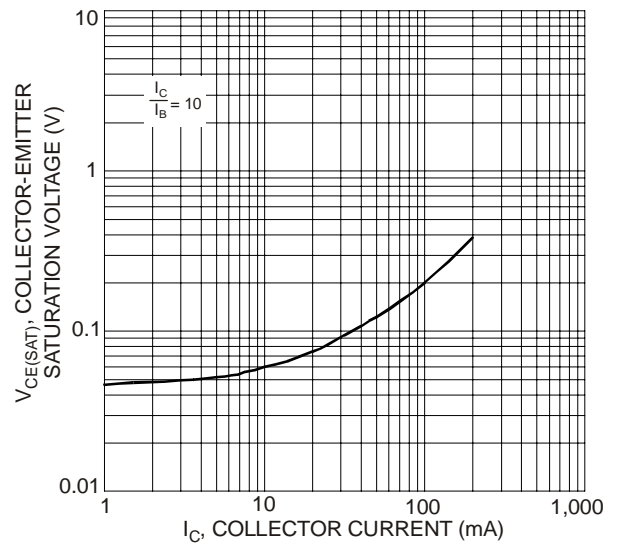


Fig. 8, Typical Collector-Emitter Saturation Voltage vs. Collector Current (PNP-3906)

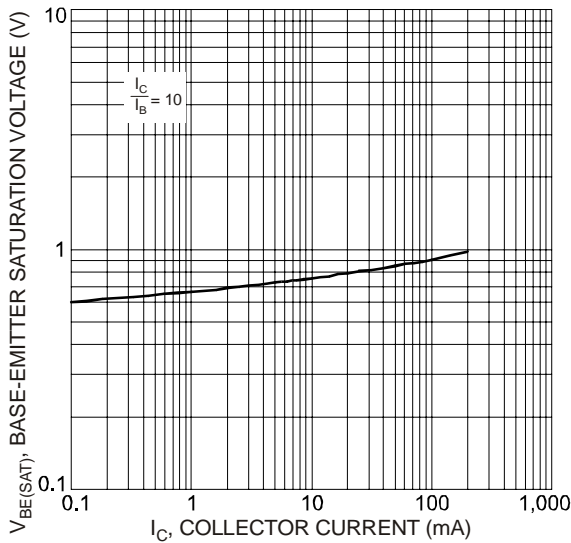


Fig. 9, Typical Base-Emitter Saturation Voltage vs. Collector Current (PNP-3906)

Ordering Information (Note 6)

| Device | Packaging | Shipping |
|---------------|-------------|------------------|
| MMDT3946LP4-7 | DFN1310H4-6 | 3000/Tape & Reel |

Notes: 6. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

Marking Information



46= Product Type Marking Code

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