

3469674 FAIRCHILD SEMICONDUCTOR

84D 27459 D



A Schlumberger Company

PN5135/FTSO5135 T-29-23
PN5136/FTSO5136
PN5137/FTSO5137
 NPN Small Signal General Purpose Amplifiers

- P_D ... 625 mW @ $T_A = 25^\circ\text{C}$
- V_{CE0} ... 25 V (Min) (PN/FTSO5135)
- h_{FE} ... 50-600 @ 10 mA (PN/FTSO5135), 20-400 @ 150 mA (PN/FTSO5136/7)
- f_T ... 40 MHz (Min)
- Complements ... PN5142, PN5143

PACKAGE

| | |
|----------|-------------|
| PN5135 | TO-92 |
| PN5136 | TO-92 |
| PN5137 | TO-92 |
| FTSO5135 | TO-236AA/AB |
| FTSO5136 | TO-236AA/AB |
| FTSO5137 | TO-236AA/AB |

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

| | |
|--------------------------------|------------------|
| Storage Temperature | -55° C to 150° C |
| Operating Junction Temperature | 150° C |

Power Dissipation (Notes 2 & 3)

| Total Dissipation at | PN | FTSO |
|---------------------------|---------|----------|
| 25° C Ambient Temperature | 0.625 W | 0.350 W* |
| 25° C Case Temperature | 1.0 W | |

Voltages & Currents

| | 5135 | 5136/7 |
|---|--------|--------|
| V_{CE0} Collector to Emitter Voltage (Note 4) | 25 V | 20 V |
| V_{CBO} Collector to Base Voltage | 30 V | 30 V |
| V_{CES} Collector to Emitter Voltage | 30 V | 30 V |
| V_{EBO} Emitter to Base Voltage | 4.0 V | 3.0 V |
| I_C Collector Current | 200 mA | 200 mA |

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

| SYMBOL | CHARACTERISTIC | 5135 | | 5136 | | UNITS | TEST CONDITIONS |
|------------|--|------|-----|------|-----|----------|--|
| | | MIN | MAX | MIN | MAX | | |
| BV_{CES} | Collector to Emitter Breakdown Voltage | 30 | | 30 | | V | $I_C = 100 \mu\text{A}, V_{BE} = 0$ |
| BV_{CBO} | Collector to Base Breakdown Voltage | 30 | | 30 | | V | $I_C = 100 \mu\text{A}, I_E = 0$ |
| BV_{EBO} | Emitter to Base Breakdown Voltage | 4.0 | | 3.0 | | V | $I_E = 10 \mu\text{A}, I_C = 0$ |
| I_{EBO} | Emitter Cutoff Current | | 10 | | 100 | nA μA | $V_{EB} = 2.0 \text{ V}, I_C = 0$ $V_{EB} = 4.0 \text{ V}, I_C = 0$ |

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
 2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
 3. These ratings give a maximum junction temperature of 150° C and (TO-92) junction-to-case thermal resistance of 125° C/W (derating factor of 8.0 mW/°C); junction-to-ambient thermal resistance of 200° C/W (derating factor of 5.0 mW/°C); (TO-236) junction-to-ambient thermal resistance of 357° C/W (derating factor of 2.8 mW/°C).
 4. Rating refers to a high current point where collector to emitter voltage is lowest.
 5. Pulse conditions: length = 300 μs; duty cycle = 1%.
 6. For product family characteristic curves, refer to Curve Set T145.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN5135/FTSO5135
 PN5136/FTSO5136
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ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

| SYMBOL | CHARACTERISTIC | 5135 | | 5136 | | UNITS | TEST CONDITIONS |
|---------------|---|------|-----|------|------|---------------|---|
| | | MIN | MAX | MIN | MAX | | |
| I_{CBO} | Collector Cutoff Current | 300 | | | 100 | nA | $V_{CB} = 15\text{ V}, I_E = 0$ $V_{CB} = 20\text{ V}, I_E = 0$ $V_{CB} = 15\text{ V}, I_E = 0$ $T_A = 65^\circ\text{ C}$ $V_{CB} = 20\text{ V}, I_E = 0,$ $T_A = 65^\circ\text{ C}$ |
| | | | 10 | | | nA | |
| | | | | | 10 | μA | |
| | | | | | | μA | |
| h_{FE} | DC Pulse Current Gain (Note 5) | 50 | 600 | | | | $I_C = 10\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 2.0\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 150\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 30\text{ mA}, V_{CE} = 1.0\text{ V}$ |
| | | 15 | | 20 | 400 | | |
| | | | | 20 | | | |
| | | | | | | | |
| $V_{CE(sus)}$ | Collector to Emitter Sustaining Voltage (Notes 4 & 5) | 25 | | 20 | | V | $I_C = 1.0\text{ mA (pulsed)}, I_B = 0$ |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage (Note 5) | | 1.0 | | 0.25 | V | $I_C = 100\text{ mA}, I_B = 10\text{ mA}$ $I_C = 150\text{ mA}, I_B = 15\text{ mA}$ |
| $V_{BE(ON)}$ | Base to Emitter "On" Voltage (Note 5) | | 1.0 | | 1.1 | V | $I_C = 100\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}, V_{CE} = 1.0\text{ V}$ |
| $V_{BE(sat)}$ | Base to Emitter Saturation Voltage (Note 5) | | 1.0 | | 1.1 | V | $I_C = 100\text{ mA}, I_B = 10\text{ V}$ $I_C = 150\text{ mA}, I_B = 15\text{ V}$ |
| C_{cb} | Collector to Base Capacitance | | 25 | | 35 | pF | $V_{CB} = 10\text{ V}, I_E = 0, f = 1.0\text{ MHz}$ |
| C_{eb} | Emitter to Base Capacitance | | | | 85 | pF | $V_{EB} = 0.5\text{ V}, I_C = 0, f = 1.0\text{ MHz}$ |
| $ h_{fe} $ | Magnitude of Common Emitter Small Signal Current Gain | 2.0 | 15 | | | | $I_C = 30\text{ mA}, V_{CE} = 10\text{ V},$ $f = 20\text{ MHz}$ $I_C = 50\text{ mA}, V_{CE} = 5.0\text{ V},$ $f = 20\text{ MHz}$ |
| | | | | 2.0 | 20 | | |

| SYMBOL | CHARACTERISTIC | 5137 | | UNITS | TEST CONDITIONS |
|------------|--|------|-----|---------------|--|
| | | MIN | MAX | | |
| BV_{CES} | Collector to Emitter Breakdown Voltage | 30 | | V | $I_C = 100\text{ }\mu\text{A}, V_{BE} = 0$ |
| BV_{CBO} | Collector to Base Breakdown Voltage | 30 | | V | $I_C = 100\text{ }\mu\text{A}, I_E = 0$ |
| BV_{EBO} | Emitter to Base Breakdown Voltage | 3.0 | | V | $I_E = 10\text{ }\mu\text{A}, I_C = 0$ |
| I_{EBO} | Emitter Cutoff Current | | 100 | nA | $V_{EB} = 2.0\text{ V}, I_C = 0$ |
| I_{CBO} | Collector Cutoff Current | | 100 | nA | $V_{CB} = 20\text{ V}, I_E = 0$ $V_{CB} = 20\text{ V}, I_E = 0,$ $T_A = 65^\circ\text{ C}$ |
| | | | 10 | μA | |
| h_{FE} | DC Pulse Current Gain (Note 5) | 20 | 400 | | $I_C = 150\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 30\text{ mA}, V_{CE} = 1.0\text{ V}$ |
| | | 20 | | | |

FAIRCHILD SEMICONDUCTOR

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ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

| SYMBOL | CHARACTERISTIC | 5137 | | UNITS | TEST CONDITIONS |
|---------------|---|------|------|-------|---|
| | | MIN | MAX | | |
| $V_{CE(sus)}$ | Collector to Emitter Sustaining Voltage (Notes 4 & 5) | 20 | | V | $I_C = 1.0 \text{ mA (pulsed)}, I_B = 0$ |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage (Note 5) | | 0.25 | V | $I_C = 150 \text{ mA}, I_B = 15 \text{ mA}$ |
| $V_{BE(on)}$ | Base to Emitter "On" Voltage (Note 5) | | 1.1 | V | $I_C = 150 \text{ mA}, V_{CE} = 1.0 \text{ V}$ |
| $V_{BE(sat)}$ | Base to Emitter Saturation Voltage (Note 5) | | 1.1 | V | $I_C = 150 \text{ mA}, I_B = 15 \text{ V}$ |
| C_{cb} | Collector to Base Capacitance | | 35 | pF | $V_{CB} = 10 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$ |
| C_{eb} | Emitter to Base Capacitance | | 85 | pF | $V_{BE} = 0.5 \text{ V}, I_C = 0, f = 1.0 \text{ MHz}$ |
| $ h_{fe} $ | Magnitude of Common Emitter Small Signal Current Gain | 2.0 | 20 | | $I_C = 50 \text{ mA}, V_{CE} = 5.0 \text{ V}, f = 20 \text{ MHz}$ |