

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.

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PN5136/FTSO5136

PN5137/FTSO5137

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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 15	600	20 20	400		$I_C = 10\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 2.0\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 150\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 30\text{ mA}, V_{CE} = 1.0\text{ V}$
$V_{CE(sus)}$	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 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 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 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	2.0	20		$I_C = 30\text{ mA}, V_{CE} = 10\text{ V},$ $f = 20\text{ MHz}$ $I_C = 50\text{ mA}, V_{CE} = 5.0\text{ V},$ $f = 20\text{ MHz}$

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 20	400		$I_C = 150\text{ mA}, V_{CE} = 1.0\text{ V}$ $I_C = 30\text{ mA}, V_{CE} = 1.0\text{ V}$

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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_{re} $	Magnitude of Common Emitter Small Signal Current Gain	2.0	20		$I_C = 50 \text{ mA}, V_{CE} = 5.0 \text{ V}, f = 20 \text{ MHz}$