FAIRCHILD
A Schlumberger Company

PN4248/FTSO4248
PN4249/FTSO4249
PN4250/FTSO4250
PN4250A/FTSO4250A

T-29-23

PNP Low Level Low Noise Amplifiers

- V_{CEO} ... 40 V (Min) (PN4248/50); 60 V (Min) (PN4249/50A)
- h_{FE} ... 250-700 @ 100 μA (PN4250/50A)
- NF ... 2.0 dB (Max) @ 1.0 kHz (PN4250/50A)
- Excellent Beta Linearity from 1.0 μA to 50 mA

PACKAGE

PN4248	TO-92
PN4249	TO-92
PN4250	TO-92
PN4250A	TO-92
FTSO4248	TO-236AA/AB
FTSO4249	TO-236AA/AB
FTSO4250	TO-236AA/AB
FTSO4250A	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)

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

Voltages & Currents	4248/50	4249/50A
V_{CEO} Collector to Emitter Voltage (Note 4)	−40 V	−60 V
V_{CBO} Collector to Base Voltage	−40 V	−60 V
V_{CES} Collector to Emitter Voltage	−40 V	−60 V
V_{EBO} Emitter to Base Voltage	−5.0 V	−5.0 V

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

SYMBOL	CHARACTERISTIC	4248 MIN	4248 MAX	4249 MIN	4249 MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	−40		−60		V	I_E = 10 μA, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
I_{EBO}	Emitter Cutoff Current		20		20	nA	V_{EB} = −3.0 V, I_C = 0
I_{CBO}	Collector Cutoff Current		10 3.0		10 3.0	nA μA	V_{CB} = −40 V, I_E = 0 V_{CB} = −40 V, I_E = 0, T_A = 65° C
h_{FE}	DC Current Gain	50 50		100 100	300		I_C = 100 μA, V_{CE} = −5.0 V I_C = 1.0 mA, V_{CE} = −5.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	50		100			I_C = 10 mA, V_{CE} = −5.0 V

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 T219.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN4248/FTSO4248/PN4249/FTSO4249
PN4250/FTSO4250
PN4250A/FTSO4250A T-29-23

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

SYMBOL	CHARACTERISTIC	4248 MIN	4248 MAX	4249 MIN	4249 MAX	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−40		−60		V	I_C = 5.0 mA (pulsed), I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.25		−0.25	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−0.9		−0.9	V	I_C = 10 mA, I_B = 0.5 mA
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 1.0 MHz
C_{ib}	Input Capacitance		16		16	pF	V_{BE} = −0.5 V, I_C = 0, f = 1.0 MHz
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 0.5 mA, V_{CE} = −5.0 V, f = 20 MHz
h_{fe}	Small Signal Current Gain	50	1000	100	550		I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{ie}	Input Resistance			2.5	17	kΩ	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{oe}	Output Conductance			5.0	40	μmhos	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio				10	x10-4	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
NF	Wide Band Noise Figure				3.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 10 Hz to 10 kHz, R_S = 10 kΩ PBW = 15.7 kHz
NF	Narrow Band Noise Figure				3.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 10 kΩ PBW = 150 Hz
					3.0	dB	I_C = 250 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 1.0 Ω PBW = 150 Hz

PN4248/FTSO4248/PN4249/FTSO4249
PN4250/FTSO4250
PN4250A/FTSO4250A T-29-23

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

SYMBOL	CHARACTERISTIC	4250 MIN	4250 MAX	4250A MIN	4250A MAX	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−40		−60		V	I_C = 5.0 mA (pulsed), I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.25		−0.25	V	I_C = 10 mA, I_B = 0.5 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−0.9			V	I_C = 10 mA, I_B = 0.5 mA
C_{ob}	Output Capacitance		6.0		6.0	pF	V_{CB} = −5.0 V, I_E = 0, f = 1.0 MHz
C_{ib}	Input Capacitance		16			pF	V_{BE} = −0.5 V, I_C = 0, f = 1.0 MHz
h_{fe}	High Frequency Current Gain	2.5					I_C = 0.5 mA, V_{CE} = −5.0 V, f = 20 MHz
h_{fe}	Small Signal Current Gain	250	800	250	800		I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{ie}	Input Resistance	6.0	20	6.0	20	kΩ	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{oe}	Output Conductance	5.0	50	5.0	50	μmhos	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		10		10	x10-4	I_C = 1.0 mA, V_{CE} = −5.0 V, f = 1.0 kHz
NF	Wide Band Noise Figure		2.0		2.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 10 Hz to 10 kHz, R_S = 10 kΩ PBW = 15.7 kHz
NF	Narrow Band Noise Figure		2.0		2.0	dB	I_C = 20 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 10 kΩ PBW = 150 Hz
			2.0		2.0	dB	I_C = 250 μA, V_{CE} = −5.0 V, f = 1.0 kHz, R_S = 1.0 kΩ PBW = 150 Hz
BV_{CES}	Collector to Emitter Breakdown Voltage	−40		−60		V	I_E = 10 μA, I_C = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−40		−60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
I_{EBO}	Emitter Cutoff Current		20		20	nA	V_{EB} = −3.0 V, I_C = 0
I_{CBO}	Collector Cutoff Current		10			nA	V_{CB} = −40 V, I_E = 0
					10	nA	V_{CB} = −50 V, I_E = 0
			3.0			μA	V_{CB} = −40 V, I_E = 0, T_A = 65° C
h_{FE}	DC Current Gain	250	700	250	700		I_C = 100 μA, V_{CE} = −5.0 V
		250					I_C = 1.0 mA, V_{CE} = −5.0 V
h_{FE}	DC Pulse Current Gain (Note 5)	250					I_C = 10 mA, V_{CE} = −5.0 V

FAIRCHILD
A Schlumberger Company

PN4258/FTSO4258

PNP Small Signal Ultra High Speed Logic Switch

- V_{CEO} ... **12 V (Min)**
- h_{FE} ... **30-120 @ 10 mA**
- t_{on} ... **15 ns (Max) @ 10 mA**
- **Complement ... 2N/FTSO5769**

PACKAGE

PN4258	TO-92
FTSO4258	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

V_{CEO}	Collector to Emitter Voltage (Note 4)	−12 V
V_{CBO}	Collector to Base Voltage	−12 V
V_{EBO}	Emitter to Base Voltage	−4.5 V
I_C	Collector Current	50 mA

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	−12		V	$I_C = 100\ \mu A$, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.5		V	$I_E = 100\ \mu A$, $I_C = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	−12		V	$I_C = 100\ \mu A$, $V_{CE} = 0$
I_{CES}	Collector Reverse Current		10 5.0	nA μA	$V_{CE} = -6.0$ V, $V_{BE} = 0$ $V_{CE} = -6.0$ V, $V_{BE} = 0$, $T_A = 65°$ C
h_{FE}	DC Current Gain (Note 5)	30 15 30	120		$I_C = 10$ mA, $V_{CE} = -3.0$ V $I_C = 1.0$ mA, $V_{CE} = -0.5$ V $I_C = 50$ mA, $V_{CE} = -1.0$ V

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 T292.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.15 −0.5	V V	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−12		V	I_C = 3.0 mA, I_B = 0
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	−0.75	−0.95 −1.5	V V	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA
C_{cb}	Collector to Base Capacitance		3.0	pF	V_{CB} = −5.0 V, I_E = 0
C_{ib}	Input Capacitance		3.5	pF	V_{EB} = −5.0 V, I_C = 0
$\|h_{fe}\|$	Magnitude of Small Signal Current Gain	7.0 5.0			I_C = 10 mA, V_{CE} = −10 V, f = 100 MHz I_C = 10 mA, V_{CE} = −5.0 V, f = 100 MHz
t_{on}	Turn On Time (test circuit no. 348)		15	ns	$I_C \approx$ 10 mA, $I_{B1} \approx$ 1.0 mA
t_{off}	Turn Off Time (test circuit no. 348)		20	ns	$I_C \approx$ 10 mA, $I_{B1} \approx -I_{B2} \approx$ 1.0 mA
τ_s	Charge Storage Time (test circuit no. 234)		20	ns	$I_C \approx$ 10 mA, $I_{B1} \approx -I_{B2} \approx$ 10 mA

FAIRCHILD
A Schlumberger Company

PN4274/FTSO4274
PN4275/FTSO4275

T-35-15

NPN Small Signal High Speed Saturated Switches

- V_{CEO} ... **12 V (Min) (PN/FTSO4274), 15 V (Min) (PN/FTSO4275)**
- $V_{CE(sat)}$ ... **0.2 V (Max) @ 10 mA**
- f_T ... **400 MHz (Min)**
- C_{cb} ... **4.0 pF (Max) @ 5.0 V**
- τ_s ... **13 ns (Max) @ 10 mA**
- t_{on} **and** t_{off} ... **12 ns (Max) @ 10 mA**
- **Complement ... PN3640**

PACKAGE

PN4274	TO-92
PN4275	TO-92
FTSO4274	TO-236AA/AB
FTSO4275	TO-236AA/AB

3

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		**4274**	**4275**
V_{CEO}	Collector to Emitter Voltage (Note 4)	12 V	15 V
V_{CBO}	Collector to Base Voltage	30 V	40 V
V_{CES}	Collector to Emitter Voltage	30 V	40 V
V_{EBO}	Emitter to Base Voltage	4.5 V	4.5 V
I_C	Collector Current (10 μs pulse)	500 mA	500 mA
I_C	Collector Current	100 mA	100 mA

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

SYMBOL	CHARACTERISTIC	4274 MIN	4274 MAX	4275 MIN	4275 MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	30		40		V	$I_C = 10\ \mu A$, $V_{BE} = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	30		40		V	$I_C = 10\ \mu A$, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	4.5		4.5		V	$I_E = 10\ \mu A$, $I_C = 0$

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 T162.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

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

SYMBOL	CHARACTERISTIC	4274 MIN	4274 MAX	4275 MIN	4275 MAX	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		10		10	μA	V_{CB} = 20 V, I_E = 0, T_A = 65° C
I_{CES}	Collector Reverse Current		400		400	nA	V_{CE} = 20 V, V_{BE} = 0
h_{FE}	DC Pulse Current Gain	35 30 18	120	35 30 18	120		I_C = 10 mA, V_{CE} = 1.0 V I_C = 30 mA, V_{CE} = 0.4 V I_C = 100 mA, V_{CE} = 1.0 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	12		15		V	I_C = 10 mA (pulsed), I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.20 0.18 0.25 0.50 0.30		0.20 0.18 0.25 0.50 0.30	V V V V V	I_C = 10 mA, I_B = 1.0 mA I_C = 10 mA, I_B = 3.3 mA I_C = 30 mA, I_B = 3.0 mA I_C = 100 mA, I_B = 10 mA I_C = 10 mA, I_B = 1.0 mA, T_A = 65° C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.72 0.74	0.85 1.00 1.15 1.60	0.72 0.74	0.85 1.00 1.15 1.60	V V V V	I_C = 10 mA, I_B = 1.0 mA I_C = 10 mA, I_B = 3.3 mA I_C = 30 mA, I_B = 3.0 mA I_C = 100 mA, I_B = 10 mA
C_{cb}	Collector to Base Capacitance		4.0		4.0	pF	V_{CB} = 5.0 V, I_E = 0
h_{fe}	High Frequency Current Gain	4.0		4.0			I_C = 10 mA, V_{CE} = 10 V, f = 100 MHz
τ_s	Charge Storage Time Constant (test circuit no. 3111)		13		13	ns	$I_C = I_{B1} = -I_{B2}$ = 10 mA,
t_{on}	Turn On Time (test circuit no. 381)		12		12	ns	I_C = 10 mA, I_{B1} = 3.3 mA
t_{off}	Turn Off Time (test circuit no. 381)		12		12	ns	I_C = 10 mA, $I_{B1} = I_{B2}$ = 3.3 mA

FAIRCHILD
A Schlumberger Company

PN4354/FTSO4354 T-29-23
PN4355/MPS4355/FTSO4355
PN4356/MPS4356/FTSO4356

PNP General Purpose Amplifiers

- **V_{CEO} ... -60 V (Min) (PN4354, PN/MPS4355), -80 V (Min) (PN/MPS4356)**
- **$V_{CE(sat)}$ ... -1.0 V (Max) @ I_C = 1.0 A (PN/MPS4355)**
- **NF ... 3.0 dB (Max) at 1.0 kHz**
- **Complements ... PN3567, PN3569**

PACKAGE

PN4354	TO-92
PN4355	TO-92
PN4356	TO-92
MPS4355	TO-92
MPS4356	TO-92
FTSO4354	TO-236AA/AB
FTSO4355	TO-236AA/AB
FTSO4356	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/MPS	FTSO
25° C Ambient Temperature	0.625 W	0.350 W*
25° C Case Temperature	1.0 W	

Voltages & Currents		**4354/5**	**4356**
V_{CEO}	Collector to Emitter Voltage (Note 4)	−60 V	−80 V
V_{CBO}	Collector to Base Voltage	−60 V	−80 V
V_{EBO}	Emitter to Base Voltage	−5.0 V	−5.0 V
I_C	Collector Current	500 mA	500 mA

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

SYMBOL	CHARACTERISTIC	4354 MIN	4354 MAX	4355 MIN	4355 MAX	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	−60		−60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		−5.0		V	I_E = 10 μA, I_C = 0
I_{EBO}	Emitter Cutoff Current		100		100	nA	V_{EB} = −4.0 V, I_C = 0
I_{CBO}	Collector Cutoff Current		50		50	nA	V_{CB} = −50 V, I_E = 0
			5.0		5.0	μA	V_{CB} = −50 V, I_E = 0, T_A = 75° C
h_{FE}	DC Pulse Current Gain (Note 5)	25		60			I_C = 100 μA, V_{CE} = −10 V
		40		75			I_C = 1.0 mA, V_{CE} = −10 V
		50	500	100	400		I_C = 10 mA, V_{CE} = −10 V
		40		75			I_C = 100 mA, V_{CE} = −10 V
		30		75			I_C = 500 mA, V_{CE} = −10 V

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 T224.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN4354/FTSO4354 T-29-23
PN4355/MPS4355/FTSO4355
PN4356/MPS4356/FTSO4356

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

SYMBOL	CHARACTERISTIC	4354 MIN	4354 MAX	4355 MIN	4355 MAX	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−60		−60		V	I_C = 10 mA (pulsed), I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.15 −0.5		−0.15 −0.5 −1.0	V V V	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA I_C = 1.0 mA, I_B = 100 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 3)		−1.1		−1.1 −1.2	V V	I_C = 500 mA, V_{CE} = −0.5 V I_C = 1.0 A, V_{CE} = −1.0 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−0.9 −1.1		−0.9 −1.1 −1.2	V V V	I_C = 150 mA, I_B = 15 V I_C = 500 mA, I_B = 500 mA I_C = 1.0 A, I_B = 100 mA
C_{cb}	Collector to Base Capacitance		30		30	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		110		110	pF	V_{BE} = −0.5 V, I_C = 0, f = 1.0 MHz
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	1.0	5.0	1.0	5.0		I_C = 50 mA, V_{CE} = −10 V, f = 100 MHz
t_{on}	Turn On Time (test circuit no. 341)		100		100	ns	$I_C \approx$ 500 mA, $I_{B1} \approx$ 50 mA, V_{CC} = −30 V
t_{off}	Turn Off Time (test circuit no. 341)		400		400	ns	$I_C \approx$ 500 mA, $I_{B1} \approx I_{B2}$ = 50 mA, V_{CC} = −30 V
NF	Noise Figure		3.0		3.0	dB	I_C = 100 μA, V_{CE} = −10 V, f = 1.0 kHz, BW = 1.0 Hz, R_S = 1.0 kΩ

SYMBOL	CHARACTERISTIC	4356 MIN	4356 MAX	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	−60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.0		V	I_E = 10 μA, I_C = 0
I_{EBO}	Emitter Cutoff Current		100	nA	V_{EB} = −4.0 V, I_C = 0
I_{CBO}	Collector Cutoff Current		50 5.0	nA μA	V_{CB} = −50 V, I_E = 0 V_{CB} = −50 V, I_E = 0, T_A = 75° C
h_{FE}	DC Pulse Current Gain (Note 5)	25 40 50 40 30	 250 		I_C = 100 μA, V_{CE} = −10 V I_C = 1.0 mA, V_{CE} = −10 V I_C = 10 mA, V_{CE} = −10 V I_C = 100 mA, V_{CE} = −10 V I_C = 500 mA, V_{CE} = −10 V

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

SYMBOL	CHARACTERISTIC	4356 MIN	4356 MAX	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−80		V	I_C = 10 mA (pulsed), I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.15 −0.5	V V	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 3)		−1.1	V	I_C = 500 mA, V_{CE} = −0.5 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−0.9 |1.1	V V	I_C = 150 mA, I_B = 15 V I_C = 500 mA, I_B = 500 mA
C_{cb}	Collector to Base Capacitance		30	pF	V_{CB} = −10 V, I_E = 0, f = 1.0 MHz
C_{eb}	Emitter to Base Capacitance		110	pF	V_{BE} = −0.5 V, I_C = 0, f = 1.0 MHz
$\|h_{fe}\|$	Magnitude of Common Emitter Small Signal Current Gain	1.0	5.0		I_C = 50 mA, V_{CE} = −10 V, f = 100 MHz
t_{on}	Turn On Time (test circuit no. 341)		100	ns	$I_C \approx$ 500 mA, $I_{B1} \approx$ 50 mA, V_{CC} = −30 V
t_{off}	Turn Off Time (test circuit no. 341)		400	ns	$I_C \approx$ 500 mA, $I_{B1} \approx I_{B2}$ = 50 mA, V_{CC} = −30 V
NF	Noise Figure		3.0	dB	I_C = 100 μA, V_{CE} = −10 V, f = 1.0 kHz, BW = 1.0 Hz, R_S = 1.0 kΩ

FAIRCHILD
A Schlumberger Company

PN4888/FTSO4888
PN4889/FTSO4889

PNP Low Noise High Voltage Amplifiers

T-29.23

- V_{CEO} ... 150 V (Min)
- h_{FE} ... 80-300 @ 10 mA (PN/FTSO4889)
- C_{ob} ... 4.0 pF (Max)
- NF ... 3.0 dB (Max) @ 1.0 kHz (PN/FTSO4889)
- Excellent Beta Linearity from 10 μA to 50 mA

PACKAGE

PN4888	TO-92
PN4889	TO-92
FTSO4888	TO-236AA/AB
FTSO4889	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

V_{CEO}	Collector to Emitter Voltage (Note 4)	−150 V
V_{CBO}	Collector to Base Voltage	−150 V
V_{EBO}	Emitter to Base Voltage	−6.0 V
I_C	Collector Current	100 mA

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

SYMBOL	CHARACTERISTIC	4888 MIN	4888 MAX	4889 MIN	4889 MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	−150		−150		V	I_C = 100 μA, I_B = 01
BV_{CBO}	Collector to Base Breakdown Voltage	−150		−150		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−0.6		−0.6		V	I_E = 10 μA, I_C = 0
I_{EBO}	Emitter Cutoff Current		50		10	nA	V_{EB} = −4.0 V, I_C = 0
I_{CBO}	Collector Cutoff Current		50 2.5		10 0.5	nA μA	V_{CB} = −100 V, I_E = 0 V_{CB} = −100 V, I_E = 0, T_A = 65° C

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 T232.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN4888/FTSO4888
PN4889/FTSO4889 T-29-23

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

SYMBOL	CHARACTERISTIC	4888 MIN	4888 MAX	4889 MIN	4889 MAX	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	30 40	 400	60 70 80	 300		I_C = 100 μA, V_{CE} = −10 V I_C = 1.0 mA, V_{CE} = −10 V I_C = 10 mA, V_{CE} = −10 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage	−150		−150		V	I_C = 2.0 mA, I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Pulsed) (Note 5)		−0.5		−0.5	V	I_C = 10 mA, I_B = 1.0 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Pulsed) (Note 5)		−0.8		−0.7	V	I_C = 1.0 mA, V_{CE} = −10 V
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Pulsed) (Note 5)		−0.9		−0.9	V	I_C = 10 mA, I_B = 1.0 mA
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = −20 V, I_E = 0, f = 1.0 MHz
C_{ib}	Input Capacitance		30		25	pF	V_{BE} = −0.5 V, I_C = 0, f = 1.0 MHz
h_{fe}	High Frequency Current Gain	1.5	8.0	2.0	8.0		I_C = 1.0 mA, V_{CE} = −10 V, f = 20 MHz
h_{fe}	Common Emmitter Small Signal Current Gain Forward Current Transfer Ratio	30	500	65	400		I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{ie}	Small Signal Short Circuit Input Resistance	0.75	20	1.7	12	kΩ	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{oe}	Small Signal Open Circuit Output Conductance	1.4	40	3.0	25	μmhos	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{re}	Small Signal Open Circuit Reverse Voltage Feedback Ratio				5	$x10^{-4}$	I_C = 1.0 mA, V_{CE} = −10 V, f = 1.0 kHz
NF	Wide Band Noise Figure				4.0	dB	I_C = 250 μA, V_{CE} = −5.0 V, f = 10 Hz to 10 kHz, R_S = 1.0 kΩ, BW = 15.7 kHz
NF	Narrow Band Noise Figure				10	dB	I_C = 250 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, f = 100 Hz, BW = 15 Hz
					3.0	dB	I_C = 30 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, f = 1.0 kHz, BW = 150 Hz
					3.0	dB	I_C = 250 μA, V_{CE} = −5.0 V, R_S = 1.0 kΩ, f = 10 kHz, BW = 1.5 kHz
					4.0	dB	I_C = 1.0 mA, V_{CE} = −10 V, R_S = 1.0 kΩ, f = 1.0 MHz, BW = 2.0 kHz