

FAIRCHILD

A Schlumberger Company

PN4916/FTSO4916
PN4917/FTSO4917 T-29-23PNP Small Signal General Purpose
Amplifiers & Switches

- V_{CEO} ... 30 V (Min)
- h_{FE} ... 150-300 @ 10 mA
- f_T ... 450 MHz (Min) @ 10 mA
- C_{cb} ... 4.5 pF (Max)
- $r_b'C_c$... 50 ps (Max)
- Complements ... 2N3903, 2N3904

PACKAGE

PN4916	TO-92
PN4917	TO-92
FTSO4916	TO-236AA/AB
FTSO4917	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

V_{CEO} Collector to Emitter Voltage	-30 V
(Note 4)	
V_{CBO} Collector to Base Voltage	-30 V
V_{EBO} Emitter to Base Voltage	-5.0 V
I_C Collector Current	100 mA

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

SYMBOL	CHARACTERISTIC	4916		4917		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CES}	Collector to Emitter Breakdown Voltage	-30		-30		V	$I_C = 10 \mu A, V_{BE} = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	-30		-30		V	$I_C = 10 \mu A, I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	-5.0		-5.0		V	$I_E = 10 \mu A, I_C = 0$
I_{CES}	Collector Reverse Current		25		25	nA μA	$V_{CE} = -15 V, V_{EB} = 0$ $V_{CE} = -15 V, V_{EB} = 0, T_A = 65^\circ C$

NOTES:

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
- These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
- 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).
- Rating refers to a high current point where collector to emitter voltage is lowest.
- Pulse conditions: length = 300 μs ; duty cycle = 1%.
- For product family characteristic curves, refer to Curve Set T215.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN4916/FTSO4916 T-29-23
 PN4917/FTSO4917

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

SYMBOL	CHARACTERISTIC	4916		4917		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
h_{FE}	DC Current Gain	40 60		100 150			$I_C = 100 \mu A, V_{CE} = -1.0 V$ $I_C = 1.0 mA, V_{CE} = -1.0 V$
h_{FE}	DC Pulse Current Gain (Note 5)	70 15	200	150 30	300		$I_C = 10 mA, V_{CE} = -1.0 V$ $I_C = 50 mA, V_{CE} = -1.0 V$
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	-30		-30		V	$I_C = 10 mA, I_B = 0$ (pulsed)
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		-0.13		-0.13	V	$I_C = 1.0 mA, I_B = 0.1 mA$
$V_{CE(sat)}$	Pulsed Collector to Emitter Saturation Voltage (Note 5)		-0.14 -0.3		-0.14 -0.3	V V	$I_C = 10 mA, I_B = 1.0 mA$ $I_C = 50 mA, I_B = 5.0 mA$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		-0.75		-0.75	V	$I_C = 1.0 mA, I_B = 0.1 mA$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Pulsed) (Note 5)	-0.7 -0.75	-0.9 -1.1	-0.7 -0.75	-0.9 -1.1	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		4.5		4.5	pF	$V_{CE} = -10 V, I_E = 0$
C_{eb}	Emitter to Base Capacitance		8.0		8.0	pF	$V_{EB} = -0.5 V, I_C = 0$
$ h_{fe} $	Magnitude of Small Signal Current Gain	4.0		4.5			$I_C = 10 mA, V_{CE} = -20 V$, $f = 100 MHz$
$r_b'C_c$	Collector to Base Time Constant		50		50	ps	$I_C = 10 mA, V_{CE} = -20 V$, $f = 80 MHz$
t_{on}	Turn On Time (test circuit no. 407)		40		40	ns	$I_C = 50 mA, I_{B1} = 5.0 mA$,
t_{off}	Turn Off Time (test circuit no. 407)		150		150	ns	$I_C = 50 mA, I_{B1} = 5.0 mA$,
NF	Noise Figure		6.0		6.0	dB	$I_C = 1.0 mA, V_{CE} = -5.0 V$, $R_S = 100 k\Omega, BW = 15 MHz$, $f = 100 MHz$
			4.0		4.0	dB	$I_C = 100 \mu A, V_{CE} = -5.0 V$, $R_S = 1.0 k\Omega, BW = 15.7 kHz$, 3.0 dB Pts A 10 Hz & 10 kHz

3469674 FAIRCHILD SEMICONDUCTOR

84D 27452 D

FAIRCHILD

A Schlumberger Company

PN5128/FTSO5128NPN Small Signal General Purpose
Amplifiers & Switches

T-29-23

- $h_{FE} \dots 35$ (Min) @ 50 mA, 20 (Min) @ 10 mA
- $f_T \dots 150$ MHz (Min) @ 50 mA
- $t_{on} \dots 14$ ns (Typ) @ 300 mA, $t_{off} \dots 80$ ns (Typ) @ 300 mA
- $V_{CE(sat)} \dots -0.25$ V (Max) @ 150 mA, -0.35 V (Typ) @ 500 mA

PACKAGE

PN5128

TO-92

FTSO5128

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	15 V
V_{EBO} Emitter to Base Voltage	3.0 V

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	15		V	$I_C = 10 \mu\text{A}$, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	$I_E = 10 \mu\text{A}$, $I_C = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	15		V	$I_C = 10 \mu\text{A}$, $I_B = 0$
I_{CBO}	Collector Cutoff Current		50 1.0	nA μA	$V_{CE} = 10 \text{ V}$, $I_E = 0$ $V_{CE} = 10 \text{ V}$, $I_E = 0$, $T_A = 65^\circ\text{C}$
I_{EBO}	Emitter Cutoff Current		10	μA	$V_{EB} = 3.0 \text{ V}$, $I_C = 0$
h_{FE}	DC Pulse Current Gain (Note 5)	20 35	350		$I_C = 10 \text{ mA}$, $V_{CE} = 10 \text{ V}$ $I_C = 50 \text{ mA}$, $V_{CE} = 10 \text{ V}$

NOTES:

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
 - These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
 - 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 $8.0 \text{ mW}^\circ\text{C}$); junction-to-ambient thermal resistance of 200°C/W (derating factor of $5.0 \text{ mW}^\circ\text{C}$); (TO-236) junction-to-ambient thermal resistance of 357°C/W (derating factor of $2.8 \text{ mW}^\circ\text{C}$).
 - Rating refers to a high current point where collector to emitter voltage is lowest.
 - Pulse conditions: length = $300 \mu\text{s}$; duty cycle = 1%.
 - For product family characteristic curves, refer to Curve Set T145.
- * Package mounted on 99.5% alumina $8 \text{ mm} \times 8 \text{ mm} \times 0.6 \text{ mm}$.

PN5128/FTSO5128

T-29.23

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)		0.25	V	$I_C = 150 \text{ mA}$, $I_B = 15 \text{ mA}$
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	12		V	$I_C = 10 \text{ mA}$, $I_B = 0$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Pulsed) (Note 5)		1.10	V	$I_C = 150 \text{ mA}$, $I_B = 15 \text{ mA}$
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		1.1	V	$I_C = 150 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$
C_{cb}	Collector to Base Capacitance		10	pF	$V_{CB} = 10 \text{ V}$, $I_E = 0$, $f = 1.0 \text{ MHz}$
h_{fe}	High Frequency Current Gain	1.5	8.0		$I_C = 50 \text{ mA}$, $V_{CE} = 5.0 \text{ V}$, $f = 100 \text{ MHz}$

3469674 FAIRCHILD SEMICONDUCTOR

84D 27454 D

FAIRCHILD

A Schlumberger Company

PN5130/FTSO5130NPN Small Signal RF Amplifier &
Oscillator

T-29.23

- G_{ps} ... 15 dB (Typ) @ 200 MHz
- P_o ... 7.0 mW (Typ) @ 930 MHz
- NF ... 4.0 dB (Typ) @ 60 MHz

PACKAGE

PN5130

TO-92

FTSO5130

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	12 V
(Note 4)	
V_{CBO} Collector to Base Voltage	30 V
V_{EBO} Emitter to Base Voltage	1.0 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_{CEO}	Collector to Emitter Breakdown Voltage	12		V	$I_c = 3.0 \text{ mA}$, $I_B = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	$I_c = 100 \mu\text{A}$, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	1.0		V	$I_E = 10 \mu\text{A}$, $I_C = 0$
I_{CBO}	Collector Cutoff Current		50 5.0	nA μA	$V_{CB} = 10 \text{ V}$, $I_C = 0$ $V_{CB} = 10 \text{ V}$, $I_E = 0$, $T_A = 65^\circ\text{C}$
h_{FE}	DC Pulse Current Gain (Note 5)	15	250		$I_c = 8.0 \text{ mA}$, $V_{CE} = 10 \text{ V}$

NOTES:

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
- These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
- These ratings give a maximum junction temperature of 150°C and (TO-92) junction-to-case thermal resistance of 125° (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).
- Rating refers to a high current point where collector to emitter voltage is lowest.
- Pulse conditions: length = 300 μs ; duty cycle = 1%.
- For product family characteristic curves, refer to Curve Set T121.

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

PN5130/FTSO5130

T-29-23

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)		0.6	V	$I_C = 10 \text{ mA}$, $I_B = 1.0 \text{ mA}$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		1.0	V	$I_C = 10 \text{ mA}$, $I_B = 1.0 \text{ mA}$
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		1.0	V	$I_C = 10 \text{ mA}$, $V_{CE} = 10 \text{ V}$
C_{cb}	Collector to Base Capacitance		1.7	pF	$V_{EB} = 10 \text{ V}$, $I_E = 0$, $f = 1.0 \text{ MHz}$
h_{fe}	Forward Current Transfer Ratio	12	300		$I_C = 8.0 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 1.0 \text{ kHz}$
$ h_{fe} $	Magnitude of Small Signal Current Gain	4.5			$I_C = 8.0 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 100 \text{ MHz}$

3469674 FAIRCHILD SEMICONDUCTOR

84D 27456 D

FAIRCHILD

A Schlumberger Company

PN5133/FTSO5133

NPN Low Level Amplifiers

T-29-23

- h_{FE} ... 60 (Min), 220 (Typ) @ 1.0 mA
- BV_{CEO} ... 18 V (Min) @ 3.0 mA

PACKAGE

PN5133

FTSO5133

TO-92

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 (Notes 4 & 5) V_{CEO} Collector to Emitter Voltage 18 V V_{CBO} Collector to Base Voltage 20 V V_{EBO} Emitter to Base Voltage 3.0 V**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	20		V	$I_C = 100 \mu A$, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	$I_E = 10 \mu A$, $I_C = 0$
I_{EBO}	Emitter Cutoff Current		50	nA	$V_{EB} = 2.0 V$, $I_C = 0$
I_{CBO}	Collector Cutoff Current		50 5.0	nA μA	$V_{CB} = 15 V$, $I_E = 0$ $V_{CB} = 15 V$, $I_E = 0$, $T_A = 65^\circ C$
h_{FE}	DC Current Gain	60	1000		$I_C = 1.0 mA$, $V_{CE} = 5.0 V$
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage (Notes 3 & 4)		18	V	$I_C = 3.0 mA$, $I_B = 0$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.4	V	$I_C = 1.0 mA$, $I_B = 0.1 mA$
$V_{BE(ON)}$	Base to Emitter "On" Voltage		0.75	V	$I_C = 100 \mu A$, $V_{CE} = 5.0 V$
C_{cb}	Collector to Base Capacitance		5.0	pF	$V_{CB} = 5.0 V$, $I_E = 0$
h_{fe}	High Frequency Current Gain	2.0	20		$I_C = 1.0 mA$, $V_{CE} = 5.0 V$, $f = 20 MHz$
h_{fe}	Small Signal Current Gain	50	1100		$I_C = 1.0 mA$, $V_{CE} = 5.0 V$, $f = 1.0 kHz$

NOTES:

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
- These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
- 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).
- Rating refers to a high current point where collector to emitter voltage is lowest.
- Pulse conditions: length = 300 μs ; duty cycle = 1%.
- For product family characteristic curves, refer to Curve Set T107.
- Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

FAIRCHILD

A Schlumberger Company

PN5134/FTSO5134 7-35-09NPN Small Signal High Speed
Saturated Switch

- f_T ... 250 MHz (Min)
- C_{cb} ... 4.0 pF (Max) @ 5.0 V
- τ_{ts} ... 18 ns (Max) @ 10 mA
- t_{on} ... 18 ns (Max) @ 10 mA, t_{off} ... 18 ns (Max) @ 10 mA
- Complement ... MPS3639

PACKAGE

PN5134

FTSO5134

TO-92

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	10 V
(Note 4)	
V_{CES} Collector to Emitter Voltage	20 V
V_{CBO} Collector to Base Voltage	20 V
V_{EBO} Emitter to Base Voltage	3.5 V
I_C Collector Current	100 mA
Pulse = 10 μ s	500 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	20		V	$I_C = 10 \mu A$, $I_E = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	20		V	$I_C = 10 \mu A$, $V_{EB} = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	3.5		V	$I_E = 10 \mu A$, $I_C = 0$
I_{CBO}	Collector Cutoff Current		10	μA	$V_{CB} = 15 V$, $I_E = 0$, $T_A = 65^\circ C$
I_{CES}	Collector Reverse Current		0.40	μA	$V_{CE} = 15 V$, $V_{EB} = 0$
h_{FE}	DC Current Gain (Note 5)	20 15	150		$I_C = 10 mA$, $V_{CE} = 1.0 V$ $I_C = 30 mA$, $V_{CE} = 0.4 V$

NOTES:

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
 - These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
 - 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).
 - Rating refers to a high current point where collector to emitter voltage is lowest.
 - Pulse conditions: length = 300 μ s; duty cycle = 1%.
 - For product family characteristic curves, refer to Curve Set T132.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

T-35-09

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)		0.25	V	$I_C = 10 \text{ mA}$, $I_B = 1.0 \text{ mA}$
			0.20	V	$I_C = 10 \text{ mA}$, $I_B = 3.3 \text{ mA}$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.70 0.72	0.90	V	$I_C = 10 \text{ mA}$, $I_B = 1.0 \text{ mA}$
			1.10	V	$I_C = 10 \text{ mA}$, $I_B = 3.3 \text{ mA}$
C_{cb}	Collector to Base Capacitance		4.0	pF	$V_{CB} = 5.0 \text{ V}$, $I_E = 0$
h_{fe}	High Frequency Current Gain	2.5			$I_C = 10 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 100 \text{ MHz}$
τ_s	Charge Storage Time Constant (test circuit no. 3111)		18	ns	$I_C = 10 \text{ mA}$, $I_{B1} \approx -I_{B2} \approx 10 \text{ mA}$, $V_{CC} = 10 \text{ V}$
t_{on}	Turn On Time (test circuit no. 381)		18	ns	$I_C \approx 10 \text{ mA}$, $I_{B1} \approx 3.3 \text{ mA}$, $V_{CC} = 3.0 \text{ V}$
t_{off}	Turn Off Time (test circuit no. 381)		7.0	18	ns $I_C \approx 10 \text{ mA}$, $I_{B1} \approx 3.3 \text{ mA}$, $I_{B2} \approx -3.3 \text{ mA}$, $V_{CC} = 2.0 \text{ V}$