

FAIRCHILD

A Schlumberger Company

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

- $V_{CE0} \dots 30 \text{ V (Min)}$
- $h_{FE} \dots 150\text{-}300 @ 10 \text{ mA}$
- $f_T \dots 450 \text{ MHz (Min) @ } 10 \text{ mA}$
- $C_{cb} \dots 4.5 \text{ pF (Max)}$
- $r_b' C_c \dots 50 \text{ ps (Max)}$
- 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_{CE0} Collector to Emitter Voltage (Note 4)	-30 V
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	$I_C = 10 \mu\text{A}, V_{BE} = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	-30		-30		V	$I_C = 10 \mu\text{A}, I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	-5.0		-5.0		V	$I_E = 10 \mu\text{A}, I_C = 0$
I_{CES}	Collector Reverse Current		25 25		25 25	nA μA	$V_{CE} = -15 \text{ V}, V_{EB} = 0$ $V_{CE} = -15 \text{ V}, V_{EB} = 0, T_A = 65^\circ \text{ C}$

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 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	$I_C = 10 mA, I_B = 1.0 mA$ $I_C = 50 mA, I_B = 5.0 mA$
$V_{BE(sat)}$	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	$I_C = 10 mA, I_B = 1.0 mA$ $I_C = 50 mA, I_B = 5.0 mA$
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 4.0		6.0 4.0	dB	$I_C = 1.0 mA, V_{CE} = -5.0 V,$ $R_S = 100 k\Omega, BW = 15 MHz,$ $f = 100 MHz$ $I_C = 100 \mu A, V_{CE} = -5.0 V,$ $R_S = 1.0 k\Omega, BW = 15.7 kHz,$ 3.0 dB Pts A 10 Hz & 10 kHz

FAIRCHILD

A Schlumberger Company

PN5128/FTSO5128NPN Small Signal General Purpose
Amplifiers & Switches

T-29-23

- h_{FE} ... 35 (Min) @ 50 mA, 20 (Min) @ 10 mA
- f_T ... 150 MHz (Min) @ 50 mA
- t_{on} ... 14 ns (Typ) @ 300 mA, t_{off} ... 80 ns (Typ) @ 300 mA
- $V_{CE(sat)}$... -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	$I_C = 10 \mu A$, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0		V	$I_E = 10 \mu A$, $I_C = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	15		V	$I_C = 10 \mu A$, $I_B = 0$
I_{CBO}	Collector Cutoff Current		50 1.0	nA μA	$V_{CE} = 10 V$, $I_E = 0$ $V_{CE} = 10 V$, $I_E = 0$, $T_A = 65^\circ C$
I_{EBO}	Emitter Cutoff Current		10	μA	$V_{EB} = 3.0 V$, $I_C = 0$
h_{FE}	DC Pulse Current Gain (Note 5)	20 35	350		$I_C = 10 mA$, $V_{CE} = 10 V$ $I_C = 50 mA$, $V_{CE} = 10 V$

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 μs ; duty cycle = 1%.
 - 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.

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	$I_C = 150 \text{ mA}$, $I_B = 15 \text{ mA}$
$V_{CEO(sus)}$	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_{pe} ... 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_{CE0} Collector to Emitter Voltage (Note 4)	12 V
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_{CE0}	Collector to Emitter Breakdown Voltage	12		V	$I_c = 3.0$ mA, $I_B = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	$I_c = 100$ μ A, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	1.0		V	$I_E = 10$ μ A, $I_c = 0$
I_{CBO}	Collector Cutoff Current		50 5.0	nA μ A	$V_{CB} = 10$ V, $I_c = 0$ $V_{CB} = 10$ V, $I_E = 0$, $T_A = 65^\circ$ C
h_{FE}	DC Pulse Current Gain (Note 5)	15	250		$I_c = 8.0$ mA, $V_{CE} = 10$ 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 μ s; 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			$I_C = 8.0 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 100 \text{ MHz}$



PN5133/FTSO5133
NPN Low Level Amplifiers

T-29-23

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

PACKAGE
PN5133 TO-92
FTSO5133 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:

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 T107.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.



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

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

PACKAGE	
PN5134	TO-92
FTSO5134	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_{CE0} Collector to Emitter Voltage (Note 4)	10 V
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:

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 μ s; duty cycle = 1%.
 6. 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.

PN5134/FTSO5134

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	0.90	V	$I_C = 10 \text{ mA}$, $I_B = 1.0 \text{ mA}$
		0.72	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 $I_C \approx 10 \text{ mA}$, $I_{B1} \approx 3.3 \text{ mA}$, $I_{B2} \approx -3.3 \text{ mA}$, $V_{CC} = 2.0 \text{ V}$