

3469674 FAIRCHILD SEMICONDUCTOR

84D 27430 D


PN3644/FTSO3644
PN3645/FTSO3645 7-29-23

**PNP Small Signal General Purpose
Amplifiers & Switches**

- V_{CEO} ... -45 V (Min) (PN/FTSO3644), 60 V (Min) (PN/FTSO3645)
- h_{FE} ... 80-240 @ 50 mA
- t_{on} ... 40 ns (Max) @ 300 mA
- t_{off} ... 100 ns (Max) @ 300 mA
- Complements ... PN3569

PACKAGE

PN3644	TO-92
PN3645	TO-92
FTSO3644	TO-236AA/AB
FTSO3645	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

	3645	3644
V_{CEO} Collector to Emitter Voltage (Note 4)	-60 V	-45 V
V_{CBO} Collector to Base Voltage	-60 V	-45 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	3644		3645		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CBO}	Collector to Base Breakdown Voltage	-45		-60		V	$I_C = 100 \mu A, I_E = 0$
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 (Note 5)		35		35	nA	$V_{CE} = -30 V, V_{BE} = 0$
			2.0		2.0	μA	$V_{CE} = -50 V, V_{BE} = 0$
						μA	$V_{CE} = -30 V, V_{BE} = 0, T_A = 65^\circ C$
						μA	$V_{CE} = -50 V, V_{BE} = 0, T_A = 65^\circ C$
h_{FE}	DC Current Gain	40		40			$I_C = 100 \mu A, V_{CE} = -10 V$
		80		80			$I_C = 1.0 mA, V_{CE} = -10 V$

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° 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 T212.

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

PN3644/FTSO3644

PN3645/FTSO3645 T-29-23

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

SYMBOL	CHARACTERISTIC	3644		3645		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
h_{FE}	DC Pulse Current Gain (Note 5)	100 80 100 20	240 300	100 80 100 20	240 300		$I_C = 10 \text{ mA}$, $V_{CE} = -10 \text{ V}$ $I_C = 50 \text{ mA}$, $V_{CE} = 1.0 \text{ V}$ $I_C = 150 \text{ mA}$, $V_{CE} = -10 \text{ V}$ $I_C = 300 \text{ mA}$, $V_{CE} = -2.0 \text{ V}$
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage (Pulsed) (Notes 4 & 5)	-45		-60		V	$I_C = 10 \text{ mA}$, $I_B = 0$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Pulsed) (Note 5)		-0.25		-0.25	V	$I_C = 50 \text{ mA}$, $I_B = 2.5 \text{ mA}$
			-0.4		-0.4	V	$I_C = 150 \text{ mA}$, $I_B = 15 \text{ mA}$
			-1.0		-1.0	V	$I_C = 300 \text{ mA}$, $I_B = 30 \text{ mA}$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Pulsed) (Note 5)		-1.0		-1.0	V	$I_C = 50 \text{ mA}$, $I_B = 2.5 \text{ mA}$
			-1.3		-1.3	V	$I_C = 150 \text{ mA}$, $I_B = 15 \text{ mA}$
		-0.8	-2.0	-0.8	-2.0	V	$I_C = 300 \text{ mA}$, $I_B = 30 \text{ mA}$
C_{ob}	Output Capacitance		8.0		8.0	pF	$V_{CB} = -10 \text{ V}$, $I_E = 0$, $f = 140 \text{ kHz}$
C_{ib}	Input Capacitance		35		35	pF	$V_{EB} = -0.5 \text{ V}$, $I_C = 0$, $f = 140 \text{ kHz}$
h_{fe}	High Frequency Current Gain	2.0		2.0			$I_C = 20 \text{ mA}$, $V_{CE} = -20 \text{ V}$, $f = 100 \text{ MHz}$
t_{on}	Turn On Time (test circuit no. 246)		40		40	ns	$I_C \approx 300 \text{ mA}$, $I_{B1} \approx 30 \text{ mA}$, $V_{CC} = -30 \text{ V}$
t_{off}	Turn Off Time (test circuit no. 246)		100		100	ns	$I_C \approx 300 \text{ mA}$, $I_{B1} \approx I_{B2} \approx 30 \text{ mA}$, $V_{CC} = -30 \text{ V}$

FAIRCHILD

A Schlumberger Company

PN/MPS/FTSO3646 T-35-15
2N/FTSO5772NPN High Speed Saturated Logic
Switches

- $V_{CEO} \dots 15 \text{ V (Min)}$
- $\tau_B \dots 18 \text{ ns (Max) @ } 10 \text{ mA}$
- $t_{on} \dots 18 \text{ ns (Max) @ } 300 \text{ mA}$
- $t_{off} \dots 28 \text{ ns (Max) @ } 300 \text{ mA}$

ABSOLUTE MAXIMUM RATINGS (Note 1)**Temperatures**

Storage Temperature $-55^\circ \text{C to } 150^\circ \text{C}$
 Operating Junction Temperature 150°C

Power Dissipation (Notes 2 & 3)

Total Dissipation at	MPS	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	15 V
(Note 4)	
V_{CES} Collector to Emitter Voltage	40 V
V_{CBO} Collector to Base Voltage	40 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C Collector Current	200 mA
Pulse = 10 μs	500 mA

PACKAGE

PN3646	TO-92
MPS3646	TO-92
2N5772	TO-92
FTSO3646	TO-236AA/AB
FTSO5772	TO-236AA/AB

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	40		V	$I_C = 10 \mu\text{A}, V_{BE} = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	$I_C = 0, I_E = 100 \mu\text{A}$
BV_{CBO}	Collector to Base Breakdown Voltage	40		V	$I_C = 100 \mu\text{A}, I_E = 0$
I_{CES}	Collector Reverse Current		0.5	μA	$V_{CE} = 20 \text{ V}, V_{BE} = 0$
h_{FE}	DC Current Gain (Note 5)	30 25 15	120		$I_C = 30 \text{ mA}, V_{CE} = 0.4 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 0.5 \text{ V}$ $I_C = 300 \text{ mA}, V_{CE} = 1.0 \text{ V}$

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 (TO92) 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); (TO236) 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 T162.
- * Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN/MPS/FTSO3646
2N/FTSO5772

T-35-15

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	15		V	$I_C = 10 \text{ mA}$, $I_B = 0$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.20	V	$I_C = 30 \text{ mA}$, $I_B = 3.0 \text{ mA}$
			0.28	V	$I_C = 100 \text{ mA}$, $I_B = 10 \text{ mA}$
			0.5	V	$I_C = 300 \text{ mA}$, $I_B = 30 \text{ mA}$
			0.3	V	$I_C = 30 \text{ mA}$, $I_B = 3.0 \text{ mA}$, $T_A = 65^\circ \text{C}$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.75	0.95	V	$I_C = 30 \text{ mA}$, $I_B = 3.0 \text{ mA}$
			1.2	V	$I_C = 100 \text{ mA}$, $I_B = 10 \text{ mA}$
			1.7	V	$I_C = 300 \text{ mA}$, $I_B = 30 \text{ mA}$
C_{ob}	Output Capacitance		5.0	pF	$V_{CB} = 5.0 \text{ V}$, $I_E = 0$, $f = 140 \text{ kHz}$
C_{TE}	Emitter Transition Capacitance		8.0	pF	$V_{BE} = 0.5 \text{ V}$, $I_C = 0$, $f = 140 \text{ kHz}$
h_{fe}	High Frequency Current Gain	3.5			$I_C = 30 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 100 \text{ MHz}$
τ_s	Charge Storage Time Constant (test circuit no. 3111)		18	ns	$I_C \approx I_{B1} \approx -I_{B2} \approx 10 \text{ mA}$, $V_{CC} = 10 \text{ V}$
t_{on}	Turn On Time (test circuit no. 233)		18	ns	$I_C \approx 300 \text{ mA}$, $I_{B1} \approx 30 \text{ mA}$, $V_{CC} = 10 \text{ V}$
t_{off}	Turn Off Time (test circuit no. 233)		28	ns	$I_C \approx 300 \text{ mA}$, $I_{B1} \approx -I_{B2} = 30 \text{ mA}$, $V_{CC} = 10 \text{ V}$

3469674 FAIRCHILD SEMICONDUCTOR

84D 27434 D


PN3693/FTSO3693 T-29-23
PN3694/FTSO3694
**NPN Small Signal General Purpose
Amplifiers**

- V_{CEO} ... 45 V (Min)
- h_{FE} ... 100-400 (PN/FTSO3694)
- A_{PG} ... 55 dB (Typ) @ 455 kHz
- G_C ... 20 dB (Typ) from 108 MHz to 10.7 MHz
- NF ... 4.0 dB (Typ) @ 1.0 MHz
- Complements ... PN4121, PN4122

PACKAGE

PN3693	TO-92
PN3694	TO-92
FTSO3693	TO-236AA/AB
FTSO3694	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	45 V
(Note 4)	
V_{CBO} Collector to Base Voltage	45 V
V_{EBO} Emitter to Base Voltage	4.0 V
I_C Collector Current	30 mA

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

SYMBOL	CHARACTERISTIC	3693		3694		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CBO}	Collector to Base Breakdown Voltage	45		45		V	$I_C = 0.1$ mA, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	4.0		4.0		V	$I_E = 100$ μ A, $I_C = 0$
I_{EBO}	Emitter Cutoff Current		100		100	μ A	$V_{EB} = 4.0$ V, $I_C = 0$
I_{CBO}	Collector Cutoff Current		50 5.0		50 5.0	nA μ A	$V_{CB} = 30$ V, $I_E = 0$ $V_{CB} = 30$ V, $I_E = 0$, $T_A = 65^\circ$ C
h_{FE}	DC Pulse Current Gain (Note 5)	40	160	100	400		$I_C = 10$ mA, $V_{CE} = 10$ V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	45		45		V	$I_C = 10$ mA (pulsed), $I_E = 0$

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 T144.
- Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

FAIRCHILD SEMICONDUCTOR

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84D 27435 D

PN3693/FTSO3693

PN3694/FTSO3694

T-29-23

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

SYMBOL	CHARACTERISTIC	3693		3694		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
C_{ob}	Output Capacitance	0.5	6.0	0.5	6.0	pF	$V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 1.0\text{ MHz}$
h_{fe}	High Frequency Current Gain	2.0	5.0	2.0	5.0		$I_C = 10\text{ mA}$, $V_{CE} = 15\text{ V}$, $f = 100\text{ MHz}$
$r_b'C_c$	Collector Base Time Constant		55		55	ps	$I_C = 10\text{ mA}$, $V_{CE} = 15\text{ V}$, $f = 80\text{ MHz}$



PN4121/FTSO4121
PN4122/FTSO4122 7-29.23
 PNP Small Signal General Purpose
 Amplifiers & Switches

- V_{CEO} ... 40 V (Min)
- h_{FE} ... 150-300 @ 10 mA (PN/FTSO4122)
- f_T ... 450 MHz (Min) @ 10 mA (PN/FTSO4122)
- $r_b'C_c$... 50 ps (Max)
- C_{cb} ... 4.5 pF (Max)
- NF ... 6.0 dB (Max) @ 100 MHz

PACKAGE

PN4121	TO-92
PN4122	TO-92
FTSO4121	TO-236AA/AB
FTSO4122	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		0.350 W*
25° C Ambient Temperature	0.625 W	
70° C Ambient Temperature	0.400 W	
25° C Case Temperature	1.0 W	

Voltages & Currents

V_{CEO} Collector to Emitter Voltage	-40 V
(Note 4)	
V_{CBO} Collector to Base Voltage	-40 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	4121		4122		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CES}	Collector to Emitter Breakdown Voltage	-40		-40		V	$I_C = 10 \mu A, V_{BE} = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	-40		-40		V	$I_C = 10 \mu A, I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	-5.0		-50.0		V	$I_E = 10 \mu A, I_C = 0$
I_{CES}	Collector Reverse Current		25 25		25 25	nA μA	$V_{CE} = -30 V, V_{BE} = 0$ $V_{CE} = -30 V, V_{BE} = 0, T_A = 65^\circ C$
h_{FE}	DC Current Gain	40 60		100 150			$I_C = 100 \mu A, V_{CE} = -1.0 V$ $I_C = 1.0 mA, V_{CE} = -1.0 V$

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.

PN4121/FTSO4121

PN4122/FTSO4122

T-29-23

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

SYMBOL	CHARACTERISTIC	4121		4122		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
h_{FE}	DC Pulse Current Gain (Note 5)	70 15	200	150 30	300		$I_C = 10 \text{ mA}$, $V_{CE} = -1.0 \text{ V}$ $I_C = 50 \text{ mA}$, $V_{CE} = -1.0 \text{ V}$
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	-40		-40		V	$I_C = 10 \text{ mA}$, $I_B = 0$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		-0.13		-0.13	V	$I_C = 1.0 \text{ mA}$, $I_B = 0.1 \text{ mA}$
			-0.14		-0.14	V	$I_C = 10 \text{ mA}$, $I_B = 1.0 \text{ mA}$
			-0.3		-0.3	V	$I_C = 50 \text{ mA}$, $I_B = 5.0 \text{ mA}$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		-0.75		-0.75	V	$I_C = 1.0 \text{ mA}$, $I_B = 0.1 \text{ mA}$
		-0.7	-0.9	-0.7	-0.9	V	$I_C = 10 \text{ mA}$, $I_B = 1.0 \text{ mA}$
			-1.1		-1.1	V	$I_C = 50 \text{ mA}$, $I_B = 5.0 \text{ mA}$
C_{cb}	Collector to Base Capacitance		4.5		4.5	pF	$V_{CB} = -10 \text{ V}$, $I_E = 0$
C_{ib}	Open Circuit Input Capacitance		8.0		8.0	pF	$V_{EB} = -0.5 \text{ V}$, $I_C = 0$
$ h_{fe} $	Magnitude of Small Signal Current Gain	4.0		4.5			$I_C = 10 \text{ mA}$, $V_{CE} = -20 \text{ V}$, $f = 100 \text{ MHz}$
h_{fe}	Forward Current Transfer Ratio	50	300	150	450		$I_C = 1.0 \text{ mA}$, $V_{CE} = -10 \text{ V}$, $f = 1.0 \text{ kHz}$
h_{ie}	Input Resistance	1.0	8.0	4.0	12	k Ω	$I_C = 1.0 \text{ mA}$, $V_{CE} = -10 \text{ V}$, $f = 1.0 \text{ kHz}$
h_{oe}	Output Conductance	2.0	24	8.0	40	μmho	$I_C = 1.0 \text{ mA}$, $V_{CE} = -10 \text{ V}$, $f = 1.0 \text{ kHz}$
h_{re}	Voltage Feedback Ratio		3.0		4.0	$\times 10^{-4}$	$I_C = 1.0 \text{ mA}$, $V_{CE} = -10 \text{ V}$, $f = 1.0 \text{ kHz}$
$t_b'C_c$	Collector to Base Time Constant		50		50	ps	$I_C = 10 \text{ mA}$, $V_{CE} = -20 \text{ V}$, $f = 80 \text{ MHz}$
t_{on}	Turn On Time (test circuit no. 342)		40		40	ns	$I_C = 50 \text{ mA}$, $I_{B1} = 5.0 \text{ mA}$,
t_{off}	Turn Off Time (see test circuit no. 342)		150		150	ns	$I_{B2} = 5.0 \text{ mA}$
NF	Noise Figure		6.0		6.0	dB	$I_C = 1.0 \text{ mA}$, $V_{CE} = -5.0 \text{ V}$, $f = 100 \text{ MHz}$, $BW = 15 \text{ MHz}$, $R_S = 100 \Omega$
			4.0		4.0	dB	$I_C = 100 \mu\text{A}$, $V_{CE} = -5.0 \text{ V}$, $BW = 15 \text{ MHz}$, $R_S = 1.0 \text{ k}\Omega$, $f = 10 \text{ Hz to } 10 \text{ kHz}$