FAIRCHILD
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2N/PN/MPS/FTSO2369
2N/PN/MPS/FTSO2369A
2N/FTSO5769

T-35-15

NPN High Speed Saturated Switches

- V_{CEO} ... 15 V (Min)
- t_s ... 13 ns (Max) @ 10 mA
- t_{on} ... 12 ns (Max) @ 10 mA, t_{off} ... 18 ns (Max) @ 10 mA
- Complements ... 2N4209 (TO18), 2N5771 (TO92)

PACKAGE

2N2369	TO-18
2N2369A	TO-18
2N5769	TO-92
PN2369	TO-92
PN2369A	TO-92
MPS2369	TO-92
MPS2369A	TO-92
FTSO2369	TO-236AA/AB
FTSO2369A	TO-236AA/AB
FTSO5769	TO-236AA/AB

ABSOLUTE MAXIMUM RATINGS (Note 1)

	MPS/PN2369/A FTSO2369/69A 2N2369/69A	2N/FTSO5769
Temperatures		
Storage Temperature	-65° C to 200° C	-55° C to 150° C
Operating Junction Temperature	200° C	150° C

Power Dissipation (Notes 2 & 3)	2N2369/A	2N5769 PN/MPS	FTSO
Total Dissipation at			
25° C Ambient Temperature	0.36 W	0.625 W	0.350 W*
100° C Case Temperature	0.68 W	0.260 W	
25° C Case Temperature	1.2 W	1.0 W	

Voltages & Currents		
V_{CEO}	Collector to Emitter Voltage (Note 4)	15 V
V_{CBO}	Collector to Base Voltage	40 V
V_{CES}	Collector to Emitter Voltage	40 V
V_{EBO}	Emitter to Base Voltage	4.5 V
I_C	Collector Current	200 mA
	(Pulse = 10 μs)	500 mA

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

SYMBOL	CHARACTERISTIC	2369 MIN	2369 MAX	2369A 5769 MIN	2369A 5769 MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	40		40		V	I_C = 10 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	40		40		V	I_C = 10 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.5		4.5		V	I_E = 10 μA, 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 200° C and junction-to-case thermal resistance of 146° C/W (derating factor of 6.85 mW/° C); junction-to-ambient thermal resistance of 486° C/W (derating factor of 2.06 mW/° C) for 2N2369, 2N2369A, PN2369 and PN2369A. These ratings give a maximum junction temperature of 150° C and 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) for MPS2369 and 2N5769; (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 $\leq$ 2%.
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.

2N/PN/MPS/FTSO2369
2N/PN/MPS/FTSO2369A
2N/FTSO5769

T-35-15

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

SYMBOL	CHARACTERISTIC	2369 MIN	2369 MAX	2369A 5769 MIN	2369A 5769 MAX	UNITS	TEST CONDITIONS
I_{CBO}	Collector Cutoff Current		400 30		400 30	nA μA	V_{CB} = 20 V, I_E = 0 V_{CB} = 20 V, I_E = 0, T_A = 150° C
h_{FE}	DC Pulse Current Gain (Note 5)	40 20 20	120	 40 30 20 20	 120		I_C = 10 mA, V_{CE} = 1.0 V I_C = 100 mA, V_{CE} = 2.0 V I_C = 10 mA, V_{CE} = 0.35 V I_C = 30 mA, V_{CE} = 0.4 V I_C = 100 mA, V_{CE} = 1.0 V I_C = 10 mA, V_{CE} = 1.0 V, T_A = −55° C I_C = 10 mA, V_{CE} = 0.35 V, T_A = −55° C
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	15		15		V	I_C = 10 mA (pulsed), I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25		 0.2 0.25 0.5 0.3	V V V V V	I_C = 10 mA, I_B = 1.0 mA I_C = 10 mA, I_B = 1.0 mA I_C = 30 mA, I_B = 3.0 mA I_C = 100 mA, I_B = 10 mA I_C = 10 mA, I_B = 10 mA, T_A = 125° C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	0.70	0.85	0.70	0.85	V	I_C = 10 mA, I_B = 1.0 mA
C_{ob}	Output Capacitance		4.0		4.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 140 kHz
h_{fe}	High Frequency Current Gain	5.0		5.0			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 = 10 mA, I_{B1} = I_{B2} = 10 mA, V_{CC} = 10 V
t_{on}	Turn On Time (test circuit no. 210)		12		12	ns	I_C = 10 mA, I_{B1} = 3.0 mA, V_{CC} = 3.0 V
t_{off}	Turn Off Time (test circuit no. 210)		18		18	ns	I_C = 10 mA, I_{B1} = 3.0 mA, I_{B2} = −1.5 mA, V_{CC} = 3.0 V

SYMBOL	CHARACTERISTIC	MPS2369 MIN	MPS2369 MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	40		V	I_C = 10 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	40		V	I_C = 10 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	4.5		V	I_E = 10 μA, I_C = 0
I_{CBO}	Collector Cutoff Current		400	nA	V_{CB} = 20 V, I_E = 0, T_A = 150° C
I_{CES}	Collector Cutoff Current		30	μA	V_{CB} = 20 V, I_E = 0, T_A = 125° C

FAIRCHILD
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2N2405

T-29-23

NPN Low Power Audio Frequency Transistor

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	-65° C to 200° C
Operating Junction Temperature	175° C

Power Dissipation (Notes 2 & 3)

Total Dissipation at	
25° C Ambient Temperature	1.0 W
25° C Case Temperature	5.0 W

Voltages & Currents

V_{CEO}	Collector to Emitter Voltage (Note 4)	90 V
V_{CBO}	Collector to Base Voltage	140 V
V_{EBO}	Emitter to Base Voltage	7.0 V
I_C	Collector Current	1.0 A

PACKAGE

2N2405 TO-39

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
BV_{CER}	Collector to Emitter Breakdown Voltage	140		V	I_C = 100 mA, R_{BE} = 10 Ω
BV_{CBO}	Collector to Base Breakdown Voltage	120		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0		V	I_E = 100 μA, I_C = 0
I_{EBO}	Emitter Cutoff Current		10	nA	V_{EB} = 5.0 V
I_{CBO}	Collector Cutoff Current		10 10	nA μA	V_{CB} = 90 V V_{CB} = 90 V, I_E = 0, T_A = 150° C
LV_{CEO}	Collector to Emitter Sustain Voltage	90 90		V V	I_C = 30 mA I_C = 100 mA
h_{FE}	DC Pulse Current Gain (Note 5)	60	200		I_C = 150 mA, V_{CE} = 10 V
h_{FE}	DC Current Gain (Note 5)	35			I_C = 10 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 175° C and junction-to-case thermal resistance of 30° C/W (derating factor of 3.33 mW/° C); junction-to-ambient thermal resistance of 150° C/W (derating factor of 6.6 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 = 1.8%.
6. For product family characteristic curves, refer to Curve Set T149.

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		0.5	V	I_C = 150 mA, I_B = 15 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage		1.1	V	I_C = 150 mA, I_B = 15 mA
C_{ob}	Output Capacitance		15	pF	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz
C_{ib}	Input Capacitance		80	pF	V_{EB} = 0.5 V, I_C = 0
h_{fe}	Current Gain	50	275		I_C = 5.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{ib}	Input Resistance	4	8	Ω	I_C = 5.0 mA, V_{CE} = 10 V, f = 1.0 kHz
h_{ob}	Output Conductance		0.5	μmhos	I_C = 5.0 mA, V_{CB} = 10 V, f = 1.0 kHz
h_{rb}	Voltage Feedback Ratio		3	$x10^{-4}$	I_C = 5.0 mA, V_{CB} = 10 V, f = 1.0 kHz

FAIRCHILD
A Schlumberger Company

2N2484/FTSO2484
PN2484
2N3117/FTSO3117

T-29-23

NPN Low Level Low Noise Amplifiers

- V_{CEO} ... 60 V (Min)
- h_{FE} ... 100-500 (2N/PN/FTSO2484), 250-500 (2N/FTSO3117) @ 10 μA
- NF ... 3.0 dB (Max) (2N/PN/FTSO2484), 1.0 dB (Max) (2N/FTSO3117) @ 1.0 kHz, 2.0 dB (Max) (2N/PN/FTSO2484), 1.0 dB (Max) (2N/FTSO3117) @ 10 kHz

PACKAGE	
2N2484	TO-18
2N3117	TO-18
PN2484	TO-92
FTSO2484	TO-236AA/AB
FTSO3117	TO-236AA/AB

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures	**2N3117**	**PN/FTSO**	**2N2484**
Storage Temperature	-65° C to 200° C	-55° C to 150° C	-65° C to 300° C
Operating Junction Temperature	200° C	150° C	200° C

Power Dissipation (Notes 2 & 3)

Total Dissipation at	**2N**	**PN**
25° C Ambient Temperature	0.36 mW	0.625 W
25° C Case Temperature	1.2 W	1.0 W
Total Dissipation at	**FTSO**	
25° C Ambient Temperature	0.350 W*	

Voltages & Currents

V_{CEO}	Collector to Emitter Voltage (Note 4)	60 V
V_{CBO}	Collector to Base Voltage	60 V
V_{EBO}	Emitter to Base Voltage	6.0 V
I_C	Collector Current	50 mA

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

SYMBOL	CHARACTERISTIC	2484 MIN	2484 MAX	3117 MIN	3117 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	6.0		6.0		V	I_E = 10 μA, I_C = 0
I_{CEO}	Collector to Emitter Cutoff Current		2.0			nA	V_{CE} = 5.0 V, I_B = 0
I_{EBO}	Emitter Cutoff Current		10		10	nA	V_{EB} = 5.0 V, I_C = 0
I_{CBO}	Collector Cutoff Current		10 10		10 10	nA μA	V_{CB} = 45 V, I_E = 0 V_{CB} = 45 V, I_E = 0, T_A = 150° 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 200° C and junction-to-case thermal resistance of 147° C/W (derating factor of 6.85 mW/° C); junction-to-ambient thermal resistance of 485° C/W (derating factor of 2.06 mW/° C) for 2N2484 and 2N3117. 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.

2N2484/FTSO2484
PN2484
2N3117/FTSO3117

T-29-23

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

SYMBOL	CHARACTERISTIC	2484 MIN	2484 MAX	3117 MIN	3117 MAX	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain (Note 5)		800				I_C = 10 mA, V_{CE} = 5.0 V
		250		400			I_C = 1.0 mA, V_{CE} = 5.0 V
		200					I_C = 500 μA, V_{CE} = 5.0 V
		175		300			I_C = 100 μA, V_{CE} = 5.0 V
		100	500	250	500		I_C = 10 μA, V_{CE} = 5.0 V
		30		100			I_C = 1.0 μA, V_{CE} = 5.0 V
		20		50			I_C = 10 μA, V_{CE} = 5.0 V, T_A = −55° C
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	60		60		V	I_C = 10 mA (pulsed), I_B = 0

SYMBOL	CHARACTERISTIC	2484 MIN	2484 MAX	3117 MIN	3117 MAX	UNITS	TEST CONDITIONS
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.35		0.35	V	I_C = 1.0 mA, I_B = 0.1 mA
$V_{BE(ON)}$	Base to Emitter "On" Voltage	0.5	0.7		0.7	V	I_C = 100 μA, V_{CE} = 5.0 V
C_{ob}	Output Capacitance		6.0		4.5	pF	V_{CB} = 5.0 V, I_E = 0, f = 140 kHz
C_{ib}	Input Capacitance		6.0		6.0	pF	V_{BE} = 0.5 V, I_C = 0, f = 140 kHz
h_{fe}	High Frequency Current Gain	2.0		2.0			I_C = 0.5 mA, V_{CE} = 5.0 V, f = 30 MHz
		3.0					I_C = 50 μA, V_{CE} = 5.0 V, f = 5.0 MHz
		150	900	400	900		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{ie}	Input Resistance	3.5	24	10	24	kΩ	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{oe}	Output Conductance		40		40	μmhos	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{re}	Reverse Voltage Feedback Ratio		800		800	$x10^{-6}$	I_C = 1.0 mA, V_{CE} = 5.0 V, f ÷ 1.0 kHz
NF	Wide Band Noise Figure		3.0			dB	I_C = 10 μA, V_{CE} = 5.0 V, R_S = 10 kΩ, Power Bandwidth of 15.7 kHz with 3.0 dB pts at 10 Hz and 10 kHz

2N2484/FTSO2484
PN2484
2N3117/FTSO3117 T-29-23

Electrical Characteristics (25° C Ambient Temperature unless otherwise noted)

Symbol	Characteristic	Min.	Max.	Units	Test Conditions
NF	Narrow Band Noise Figure	3.0		dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 10 kΩ Power Bandwidth of 200 Hz
		2.0		dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 10 kHz, R_S = 10 kΩ, Power Bandwidth of 2.0 kHz
		10		dB	I_C = 10 μA, V_{CE} = 5.0 V, f = 100 Hz, R_S = 10 kΩ, Power Bandwidth of 20 Hz
			1.0	dB	I_C = 5.0 μA, V_{CE} = 5.0 V, f = 1.0 kHz, R_S = 50 kΩ, Power Bandwidth of 200 Hz
			1.0	dB	I_C = 5.0 μA, V_{CE} = 5.0 V, f = 10 kHz, R_S = 50 kΩ, Power Bandwidth of 1.0 kHz
			4.0	dB	I_C = 30 μA, V_{CE} = 5.0 V, f = 100 kHz, R_S = 10 kΩ, Power Bandwidth of 20 Hz
			1.5	dB	I_C = 30 μA, V_{CE} = 5.0 V, f = 10 Hz, R_S = 10 kΩ, Power Bandwidth of 2.0 Hz

FAIRCHILD
A Schlumberger Company

2N2586

T-29-23

NPN Low Level Low Noise Type

ABSOLUTE MAXIMUM RATINGS (Note 1)

PACKAGE
2N2586 TO-18

Temperatures
Storage Temperature -65° C to 200° C
Operating Junction Temperature 175° C

Power Dissipation (Notes 2 & 3)
Total Dissipation at
25° C Ambient Temperature 0.4 W
25° C Case Temperature 1.8 W

Voltages & Currents
V_{CEO} Collector to Emitter Voltage (Note 4) 45 V
V_{CBO} Collector to Base Voltage 60 V
V_{EBO} Emitter to Base Voltage 6.0 V
I_C Collector Current 30 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	60		V	$I_C = 10\ \mu A$, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		V	$I_E = 10\ \mu A$, $I_C = 0$
I_{CEO}	Collector to Emitter Cutoff Current		2.0	nA	$V_{CE} = 5.0$ V, $I_B = 0$
I_{CES}	Collector to Emitter Cutoff Current		2.0 10	nA μA	$V_{CE} = 45$ V, $V_{BE} = 0$ $V_{CE} = 45$ V, $V_{BE} = 0$, $T_A = 170°$ C
I_{CBO}	Collector Cutoff Current		2.0	nA	$V_{CB} = 45$ V, $I_E = 0$
I_{EBO}	Emitter Cutoff Current		2.0	nA	$V_{EB} = 5.0$ V, $I_C = 0$
h_{FE}	DC Pulse Current Gain (Note 5)		600		$I_C = 10$ mA, $V_{CE} = 5.0$ V
h_{FE}	DC Current Gain	150 120 80 40	360		$I_C = 500\ \mu A$, $V_{CE} = 5.0$ V $I_C = 10\ \mu A$, $V_{CE} = 5.0$ V $I_C = 1.0\ \mu A$, $V_{CE} = 5.0$ V $I_C = 10\ \mu A$, $V_{CE} = 5.0$ V, $T_A = 55°$ 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 175° C and junction-to-case thermal resistance of 250° C/W (derating factor of 4.0 mW/° C); junction-to-ambient thermal resistance of 500° C/W (derating factor of 2.0 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 $\leq$ 2%.
6. For product family characteristic curves, refer to Curve Set T107.

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	45		V	I_C = 10 mA, I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.5	V	I_C = 10 mA, I_B = 0.5 mA
V_{BE}	Base to Emitter Voltage	0.7	0.9	V	I_C = 10 mA, I_B = 0.5 mA
C_{obo}	Common Base Open Circuit Output Capacitance		7.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 1.0 MHz
h_{fe}	High Frequency Current Gain	1.5			I_C = 500 μA, V_{CE} = 5.0 V, f = 30 MHz
h_{fe}	Small Signal Current Gain	150	600		I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{ie}	Input Resistance	4.5	18	kΩ	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
h_{oe}	Output Admittance		100	μmhos	I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz
NF	Spot Noise Figure		2.0	dB	I_C = 1.0 μA, V_{CE} = 5.0 V, R_G = 1.0 MΩ, f = 10 kHz
			2.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, R_G = 10 kΩ, f = 10 kHz
			3.0	dB	I_C = 10 μA, V_{CE} = 5.0 V, R_G = 10 kΩ, f = 1.0 kHz
			3.5	dB	I_C = 1.0 μA, V_{CE} = 5.0 V, R_G = 1 MΩ, f = 1.0 kHz