

3469674 FAIRCHILD SEMICONDUCTOR

84D 27412 D



PE8050/PE8550 7-29-23

NPN-PNP General Purpose Complementary Amplifiers & Output Drivers

- V_{CEO} ... 25 V (Min)
- h_{FE} ... Outstanding Beta Linearity to 1.0 A
- Three h_{FE} Groups
- Guaranteed SOA
- Complements ... PE8050, (NPN), PE8550, (PNP)

PACKAGE

PE8050	TO-92
PE8550	TO-92

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

Storage Temperature	-55° C to 150° C
Operating Junction Temperature	150° C

Power Dissipation ($V_{CE} = 8.0$ V) (Notes 2 & 3)

Total Dissipation at	
25° C Ambient Temperature	0.625 W
25° C Case Temperature	1.0 W

Voltages & Currents

V_{CEO} Collector to Emitter Voltage	25 V
(Note 4)	
V_{CBO} Collector to Base Voltage	30 V
V_{EBO} Emitter to Base Voltage	6.0 V
I_C Collector Current (Continuous)	1.5 A
I_C Collector Current (Pulsed)	1.5 A

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
V_{CEO}	Collector to Emitter Breakdown Voltage (Note 5)	25		V	$I_C = 10$ mA, $I_E = 0$
V_{CBO}	Collector to Base Breakdown Voltage	30		V	$I_C = 100$ μ A, $I_E = 0$
V_{EBO}	Emitter to Base Breakdown Voltage	6.0		V	$I_E = 100$ μ A, $I_C = 0$
I_{CBO}	Collector Cutoff Current		100	nA	$V_{CB} = 20$ V, $I_E = 0$
h_{FE}	DC Current Gain (Note 5)	50	200		$I_C = 10$ mA, $V_{CE} = 1.0$ V
		65	200		$I_C = 100$ mA, $V_{CE} = 1.0$ V
		65	200		$I_C = 500$ mA, $V_{CE} = 1.0$ V
		40	200		$I_C = 1.0$ A, $V_{CE} = 1.0$ V
	Gain Grouping A	65	130		$I_C = 100$ mA, $V_{CE} = 1.0$ V
	Gain Grouping B	85	160		
	Gain Grouping C	120	200		

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 5.0 mW/° C); junction-to-ambient thermal resistance of 125° C/W (derating factor of 8.0 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 T124 for PE8050 & T202 for PE8550.

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

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
h_{FE1}/h_{FE2}	Beta Ratio at Two Currents	0.8	1.8		$I_{C1} = 100 \text{ mA}$, $I_{C2} = 800 \text{ mA}$, $V_{CE} = 1.0 \text{ V}$
h_{FE3}/h_{FE4}	Beta Ratio at Two Currents	0.8	1.5		$I_{C1} = 150 \text{ mA}$, $I_{C4} = 500 \text{ mA}$, $V_{CE} = 1.0 \text{ V}$
h_{fe}	High Frequency Current Gain	1.0			$I_C = 50 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 100 \text{ MHz}$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.15 0.5	V V	$I_C = 200 \text{ mA}$, $I_B = 20 \text{ mA}$ $I_C = 1.0 \text{ A}$, $I_B = 100 \text{ mA}$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		0.9 1.2	V V	$I_C = 200 \text{ mA}$, $I_B = 20 \text{ mA}$ $I_C = 1.0 \text{ A}$, $I_B = 100 \text{ mA}$
C_{cb}	Collector to Base Capacitance		40	pF	$V_{CB} = 10 \text{ V}$, $I_C = 0$, $f = 1.0 \text{ MHz}$

FAIRCHILD

A Schlumberger Company

PN918/MPS918/FTSO918 7-3123
PN3563/MPS3563/FTSO3563NPN Small Signal High Frequency
Amplifiers & Oscillators

- G_{FE} ... 15 dB (Min) @ 200 MHz (PN/FTSO918)
- C_{OB} ... 1.7 pF (Max) @ 10 V
- NF ... 6.0 dB (Max) @ 60 MHz

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

Storage Temperature -55° C to 150° C
Operating Junction Temperature 150° C

PACKAGE

PN918	TO-92
PN3563	TO-92
MPS918	TO-92
MPS3563	TO-92
FTSO918	TO-236AA/AB
FTSO3563	TO-236AA/AB

Power Dissipation (Notes 2 & 3)

Total Dissipation at	PN/MPS	FTSO
25° C Ambient Temperature	0.625 W	0.350 W*
65° C Ambient Temperature	0.300 W	
25° C Case Temperature	1.0 W	

Voltages & Currents

	3563	918
V_{CEO} Collector to Emitter Voltage	12 V	12 V
(Note 4)		
V_{CBO} Collector to Base Voltage	30 V	30 V
V_{EBO} Emitter to Base Voltage	2.0 V	3.0 V
I_C Collector Current	50 mA	50 mA

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

SYMBOL	CHARACTERISTIC	3563		MPS918		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CBO}	Collector to Base Breakdown Voltage	30		30		V	$I_C = 100 \mu A, I_E = 0$ $I_C = 10 \mu A, I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	2.0		3.0		V	$I_E = 10 \mu A, I_C = 0$
I_{CBO}	Collector Cutoff Current		50		10	nA	$V_{CB} = 15 V, I_E = 0$
h_{FE}	DC Current Gain (Note 5)	20	200	20			$I_C = 3.0 mA, V_{CE} = 1.0 V$ $I_C = 8.0 mA, V_{CE} = 10 V$
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	12		15		V	$I_C = 3.0 mA, I_B = 0$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)				0.4	V	$I_C = 10 mA, I_B = 1.0 mA$
$V_{BE(sat)}$	Base to Emitter Saturation Voltage				1.0	V	$I_C = 10 mA, I_B = 1.0 mA$

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 $\leq 1\%$.
 - 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.

PN918/MPS918/FTSO918 **7-31-23**
 PN3563/MPS3563/FTSO3563

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

SYMBOL	CHARACTERISTIC	3563		MPS918		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
C _{ob}	Output Capacitance		1.7		1.7 3.0	pF pF	V _{CB} = 10 V, I _E = 0, f = 1.0 MHz V _{CB} = 0, I _E = 0, f = 1.0 MHz
C _{ib}	Input Capacitance				2.0	pF	V _{EB} = 0.5 V, I _C = 0, f = 1.0 MHz
h _{fe}	High-Frequency Current Gain	6.0	15	6.0			I _C = 4.0 mA, V _{CE} = 10 V, f = 100 MHz I _C = 8.0 mA, V _{CE} = 10 V, f = 100 MHz
h _{fe}	Small Signal Current Gain	20	250				I _C = 8.0 mA, V _{CE} = 10 V, f = 1.0 kHz
G _{pe}	Available Power Gain (neutralized) (test circuit 254 for MPS918, PN/MPS3563)	14	26	15		dB dB	I _C = 6.0 mA, V _{CB} = 12 V, f = 200 MHz I _C = 8.0 mA, V _{CE} = 10 V, f = 200 MHz
P _O	Power Output (test circuit no. 264)			30		mW	I _C = 8.0 mA, V _{CB} = 15 V, f = 500 MHz
η	Collector Efficiency			25		%	I _C = 8.0 mA, V _{CB} = 15 V, f = 500 MHz
r _b 'C _c	Collector to Base Time Constant	8.0	25			pF	I _C = 8.0 mA, V _{CB} = 10 V, f = 79.8 MHz
NF	Noise Figure				6.0	dB	I _C = 1.0 mA, V _{CE} = 6.0 V, f = 60 kHz, R _G = 400 Ω

SYMBOL	CHARACTERISTIC	PN918		UNITS	TEST CONDITIONS
		MIN	MAX		
BV _{CBO}	Collector to Base Breakdown Voltage	30		V	I _C = 10 μA, I _E = 0
BV _{EBO}	Emitter to Base Breakdown Voltage	3.0		V	I _E = 10 μA, I _C = 0
I _{CBO}	Collector Cutoff Current		10 1.0	nA μA	V _{CB} = 15 V, I _E = 0 V _{CB} = 15 V, I _E = 0, T _A = 150° C
h _{FE}	DC Current Gain (Note 5)	20			I _C = 3.0 mA, V _{CE} = 1.0 V
V _{CE(sus)}	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	15		V	I _C = 3.0 mA, I _B = 0
V _{CE(sat)}	Collector to Emitter Saturation Voltage (Note 5)		0.4	V	I _C = 10 mA, I _B = 1.0 mA
V _{BE(sat)}	Base to Emitter Saturation Voltage		1.0	V	I _C = 10 mA, I _B = 1.0 mA
C _{ob}	Output Capacitance		1.7 3.0	pF pF	V _{CB} = 10 V, I _E = 0, f = 1.0 MHz V _{CB} = 0, I _E = 0, f = 1.0 MHz
C _{ib}	Input Capacitance		1.6	pF	V _{EB} = 0.5 V, I _C = 0, f = 1.0 MHz

PN918/MPS918/FTSO918
PN3563/MPS3563/FTSO3563

T-31-23

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

SYMBOL	CHARACTERISTIC	PN918		UNITS	TEST CONDITIONS
		MIN	MAX		
h_{fe}	High Frequency Current Gain	6.0			$I_C = 4.0 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 100 \text{ MHz}$
G_{pe}	Available Power Gain (neutralized) (test circuit 254 for PN918)	15		dB	$I_C = 6.0 \text{ mA}$, $V_{CB} = 12 \text{ V}$, $f = 200 \text{ MHz}$
P_o	Power Output (test circuit no. 264)	30		mW	$I_C = 8.0 \text{ mA}$, $V_{CB} = 15 \text{ V}$, $f = 500 \text{ MHz}$
η	Collector Efficiency	25		%	$I_C = 8.0 \text{ mA}$, $V_{CB} = 15 \text{ V}$, $f = 500 \text{ MHz}$
NF	Noise Figure		6.0	dB	$I_C = 1.0 \text{ mA}$, $V_{CE} = 6.0 \text{ V}$, $f = 60 \text{ kHz}$, $R_G = 400 \Omega$

3469674 FAIRCHILD SEMICONDUCTOR

84D 27417 D



PN3565/FTSO3565 7-29-23

NPN Low Level High Gain Amplifiers

- V_{CEO} ... 25 V (Min)
- h_{FE} ... 150-600 @ 1.0 mA

PACKAGE

PN3565

TO-92

FTSO3565

TO-236AA/AB

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

Storage Temperature -55° C to 150° C

Operating Junction Temperature 150° C

Power Dissipation (Note 2)

	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 (Note 3)	25 V
V_{CBO} Collector to Base Voltage	30 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 4)

SYMBOL	CHARACTERISTIC	MIN	MAX	UNITS	TEST CONDITIONS
BV_{CBO}	Collector to Base Breakdown Voltage	30		V	$I_C = 100 \mu A, I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		V	$I_C = 0, I_E = 10 \mu A$
I_{CBO}	Collector Cutoff Current		50	nA	$V_{CB} = 25 V, I_E = 0$
I_{CBO}	Collector Cutoff Current		3.0	μA	$V_{CB} = 25 V, I_E = 0, T_A = 65^\circ C$
h_{FE}	DC Current Gain	150 70	600		$I_C = 1.0 mA, V_{CE} = 10 V$ $I_C = 100 \mu A, V_{CE} = 10 V$
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage	25		V	$I_C = 2.0 mA, I_B = 0$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage		0.35	V	$I_C = 1.0 mA, I_B = 0.1 mA$
C_{ob}	Open Circuit Output Capacitance		40	pF	$I_E = 0, V_{CB} = 5.0 V, f = 140 kHz$
h_{fe}	High Frequency Current Gain	2.0	12		$I_C = 1.0 mA, V_{CE} = 5.0 V, f = 20 MHz$
h_{ie}	Input Resistance	2.0	20	k Ω	$I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz$
h_{oe}	Output Conductance	0.5	100	$\mu mhos$	$I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz$
h_{re}	Small Signal Current Gain	120	750		$I_C = 1.0 mA, V_{CE} = 5.0 V, f = 1.0 kHz$

NOTES:

- These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
- These 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.
- For product family characteristic curves, refer to Curve Set T155.

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

3469674 FAIRCHILD SEMICONDUCTOR

84D 27418 D.



PN3566/FTSO3566

NPN Small Signal General Purpose
Amplifiers

7-29-23

- V_{CEO} ... 30 V (Min)
- h_{FE} ... 150-600 @ 10 mA
- Complement ... MPS3638A

PACKAGE

PN3566
FTSO3566

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)

	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	40 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C Collector Current	200 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	40		V	$I_C = 100 \mu A, I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	$I_E = 10 \mu A, I_C = 0$
I_{CBO}	Collector Cutoff Current		50	nA	$V_{CB} = 20 V, I_E = 0$
I_{CBO}	Collector Cutoff Current		5.0	μA	$V_{CB} = 20 V, I_E = 0, T_A = 75^\circ C$
I_{EBO}	Emitter Cutoff Current		10	μA	$V_{EB} = 5.0 V, I_C = 0$
h_{FE}	DC Pulse Current Gain (Note 5)	150 80	600		$I_C = 10 mA, V_{CE} = 10 V$ $I_C = 2.0 mA, V_{CE} = 10 V$

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 $\leq 1\%$.
 - 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.

PN3566/FTSO3566

7-29-23

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 (Pulsed) (Note 5)		1.0	V	$I_C = 100 \text{ mA}$, $I_B = 10 \text{ mA}$
$V_{CE(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	30		V	$I_C = 30 \text{ mA}$, $I_B = 0$ (pulsed)
$V_{BE(ON)}$	Base to Emitter "On" Voltage (pulsed) (Note 5)		0.9	V	$I_C = 100 \text{ mA}$, $V_{CE} = 1.0 \text{ V}$
C_{ob}	Output Capacitance		25	pF	$V_{CB} = 10 \text{ V}$, $I_E = 0$, $f = 140 \text{ kHz}$
h_{fe}	High Frequency Current Gain	2.0	35		$I_C = 30 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 20 \text{ MHz}$


PN3567/FTSO3567
PN3569/FTSO3569
NPN Small Signal General Purpose Amplifiers
7-29-23

- V_{CE0} ... 40 V (Min)
- h_{FE} ... 100-300 @ 10 mA (3569); 40-120 @ 150 mA (3567)
- Complement ... MPS4355

PACKAGE

PN3567	TO-92
PN3569	TO-92
FTSO3567	TO-236AA/AB
FTSO3569	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	40 V
(Notes 4 & 6)	
V_{CBO} Collector to Base Voltage	80 V
V_{EBO} Emitter to Base Voltage	5.0 V
I_C Collector Current	500 mA
I_B Base Current	100 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 7)

SYMBOL	CHARACTERISTIC	3567		3569		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
BV_{CE0}	Collector to Emitter Breakdown Voltage (Note 5)	40		40		V	$I_C = 30$ mA, $I_B = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	80		80		V	$I_C = 100$ μ A, $I_E = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		V	$I_E = 10$ μ A, $I_C = 0$
I_{CBO}	Collector Cutoff Current		50		50	nA	$V_{CB} = 40$ V, $I_E = 0$
			5.0		5.0	μ A	$V_{CB} = 40$ V, $I_E = 0$, $T_A = 75^\circ$ C
I_{EBO}	Emitter Cutoff Current		25		25	nA	$V_{EB} = 4.0$ V, $I_C = 0$

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 μ s; duty cycle = 1%.
6. Applicable 0 to 30 mA.
7. 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.

FAIRCHILD SEMICONDUCTOR

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3469674 FAIRCHILD SEMICONDUCTOR

84D 27421 D

PN3567/FTSO3567
PN3569/FTSO3569

T-29-23

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 7)

SYMBOL	CHARACTERISTIC	3567		3569		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
h_{FE}	DC Current Gain (Note 5)	40 40	120	100 100	300		$I_C = 150 \text{ mA}$, $V_{CE} = 1.0 \text{ V}$ $I_C = 30 \text{ mA}$, $V_{CE} = 1.0 \text{ V}$
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.25		0.25	V	$I_C = 150 \text{ mA}$, $I_B = 15 \text{ mA}$
$V_{BE(ON)}$	Base to Emitter "On" Voltage (Note 5)		1.1		1.1	V	$I_C = 150 \text{ mA}$, $V_{CE} = 1.0 \text{ V}$
C_{cb}	Collector to Base Capacitance		20		20	pF	$V_{CB} = 10 \text{ V}$, $I_E = 0$, $f = 140 \text{ kHz}$
C_{eb}	Emitter to Base Capacitance		80		80	pF	$V_{EB} = 0.5 \text{ V}$, $I_C = 0$, $f = 140 \text{ kHz}$
$ h_{ie} $	Magnitude of Common Emitter Small Signal Current Gain	3.0	30	3.0	30		$I_C = 50 \text{ mA}$, $V_{CE} = 10 \text{ V}$, $f = 20 \text{ MHz}$