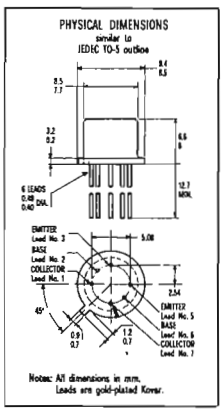
BFX99

DUAL DIFFERENTIAL AMPLIFIER

NPN DIFFUSED SILICON PLANAR TRANSISTORS

GENERAL DESCRIPTION - The BFX99 is a six terminal device containing two isolated high gain, low noise NPN silicon PLANAR transistors in one hermetically sealed enclosure. It is designed for use in high performance amplifier and differential amplifier circuits, requiring tight V_{BE} matching, tight V_{BE} tracking, low noise in a very wide current range from 100 μA to 50 mA.



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

T_{STG}	Storage Temperature	- 55°C to + 200°C
T_J	Operating Junction Temperature	+ 200°C
T_L	Lead Temperature (Soldering, 10 sec. time limit)	+ 260°C

Maximum Power Dissipations (Notes 2 and 3)

		One Side	Both Sides
P_D	Total Dissipation at 25°C Case Temperature	1.5 Watt	3 Watts
	at 100°C Case Temperature	0.86 Watt	1.7 Watt
	at 25°C Ambient Temperature	0.5 Watt	0.6 Watt

Maximum Voltages and Current (25°C free air temperature unless otherwise noted)

V_{CBO}	Collector Base Voltage	100 Volts
V_{CEO}	Collector Emitter Voltage (Note 4)	60 Volts
V_{CER}	Collector Emitter Voltage (R_{BE} = 10 Ω) (Note 4)	80 Volts
V_{EBO}	Emitter Base Voltage	7 Volts
I_C	DC Collector Current	500 mA
$V_{1C\text{-}2C}$	Collector$_1$ - Collector$_2$ Voltage	± 200 Volts

ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

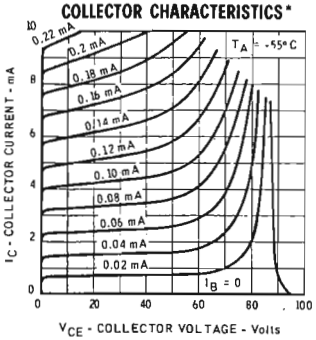
SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS	
h_{FE}	DC Current Gain	25	50	75		I_C = 10 μA	V_{CE} = 5 V
h_{FE}	DC Current Gain	30	60	90		I_C = 100 μA	V_{CE} = 5 V
h_{FE}	DC Pulse Current Gain (Note 6)	40	80	120		I_C = 1 mA	V_{CE} = 5 V
h_{FE}	DC Pulse Current Gain (Note 6)	50	100	150		I_C = 10 mA	V_{CE} = 5 V
$V_{BE\ sat}$	Base-Emitter Saturation Voltage (Note 6)			0.9	V	I_C = 50 mA	I_B = 5 mA
$V_{CE\ sat}$	Collector-Emitter Saturation Voltage (Note 6)			0.6	V	I_C = 50 mA	I_B = 5 mA
I_{EBO}	Emitter-Cutoff Current			2	nA	V_{EB} = 5 V	I_C = 0
I_{CBO}	Collector-Cutoff Current		0.4	2	nA	V_{CB} = 80 V	I_E = 0
I_{CBO} (125°C)	Collector-Cutoff Current		1.3	10	μA	V_{CB} = 80 V	I_E = 0
BV_{CBO}	Collector-Base Breakdown Voltage	100			V	I_C = 100 μA	I_E = 0
BV_{EBO}	Emitter-Base Breakdown Voltage	7			V	I_E = 100 μA	I_C = 0

ELECTRICAL CHARACTERISTICS (25°C free air temperoture unless otherwise noted)

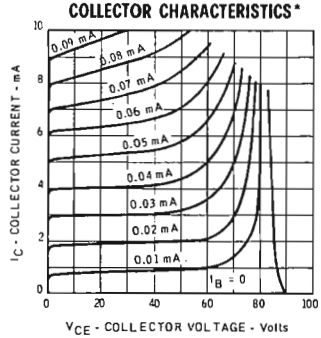
SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS	
LV_{CER}	Collectar-Emitter Sustaining Voltoge (Notes 4 and 6)	80			V	I_C = 100 mA	$R_{BE} \leq 10\,\Omega$
LV_{CEO}	Collector-Emitter Sustaining Voltage (Notes 4 and 6)	60			V	I_C = 30 mA	I_B = 0
h_{fe}	Smoll Signal Current Gain (f = 1 KHz)	50		150		I_C = 1 mA	V_{CE} = 5 V
h_{ie}	Input Resistance (f = 1 KHz)	1		4	KΩ	I_C = 1 mA	V_{CE} = 5 V
h_{oe}	Output Conductance (f = 1 KHz)	4		16	μmho	I_C = 1 mA	V_{CE} = 5 V
h_{re}	Voltage Feedbock Rotio (f = 1 KHz)			10	$\times 10^{-4}$	I_C = 1 mA	V_{CE} = 5 V
h_{ib}	Input Resistance (f = 1 KHz)	20		30	Ω	I_C = 1 mA	V_{CB} = 5 V
h_{fe}	High Frequency Current Gain (f = 20MHz)	3	5	8		I_C = 50 mA	V_{CE} = 10 V
C_{obo}	Base-Collector Capacitance		12	15	pF	V_{CB} = 10 V	I_E = 0
C_{TE}	Emitter Transition Capacitance		60	85	pF	V_{EB} = 0.5 V	I_C = 0
NF	Broad Band Noise Figure (Note 7)			8	dB	I_C = 300 μA	V_{CE} = 10 V
NF	Norraw Bond Naise Figure (Note 8)		3.2	8	dB	I_C = 300 μA	V_{CE} = 10 V
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio(Note 5)	0.9		1		I_C = 100 μA to 1 mA	V_{CE} = 5 V
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Goin Ratio (Nate 5) (T_A = - 55°C to + 125°C)	0.85		1		I_C = 100 μA to 1 mA	V_{CE} = 5 V
$\lvert V_{BE1}-V_{BE2}\rvert$	Base Emitter Voltage Difference			1.5	mV	I_C = 100 μA to 1 mA	V_{CE} = 5 V
$\Delta\lvert V_{BE1}-V_{BE2}\rvert$	Base Emitter Voltage Difference Change (T_A = - 55°C to + 25°C)			0.4	mV	I_C = 100 μA	V_{CE} = 5 V
$\Delta\lvert V_{BE1}-V_{BE2}\rvert$	Base Emitter Voltage Difference Change (T_A = + 25°C to + 125°C)			0.5	mV	I_C = 100 μA	V_{CE} = 5 V

TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

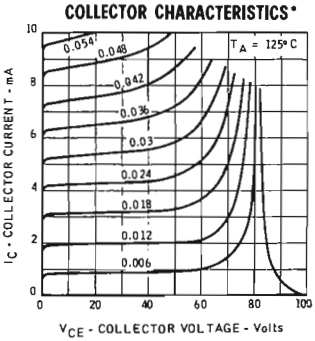
COLLECTOR CHARACTERISTICS*



COLLECTOR CHARACTERISTICS*



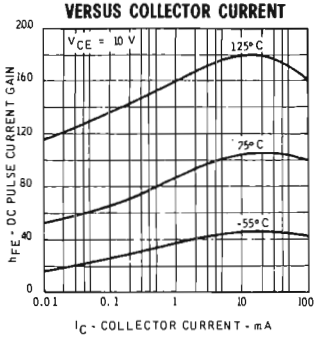
COLLECTOR CHARACTERISTICS*



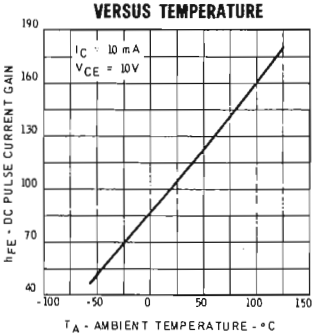
* Single family characteristics on Transistor Curve Tracer.

TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

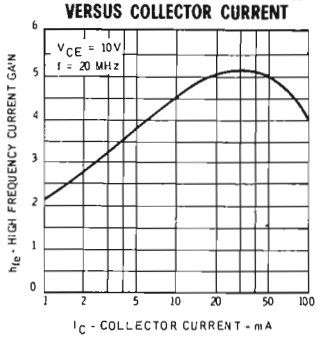
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



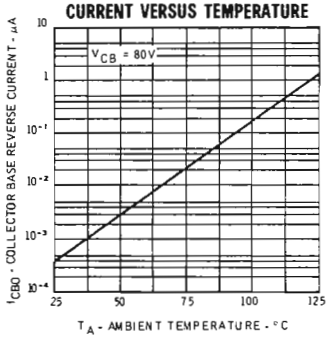
DC PULSE CURRENT GAIN VERSUS TEMPERATURE



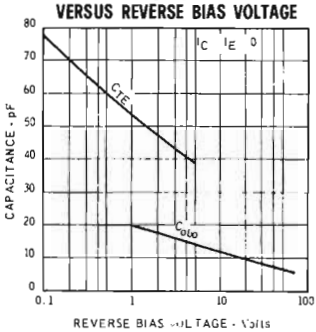
HIGH FREQUENCY CURRENT GAIN VERSUS COLLECTOR CURRENT



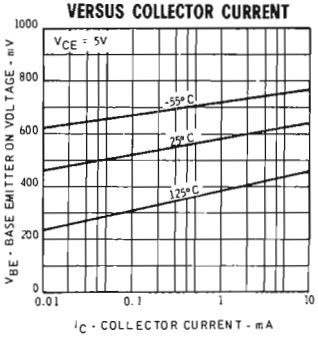
COLLECTOR-BASE REVERSE CURRENT VERSUS TEMPERATURE



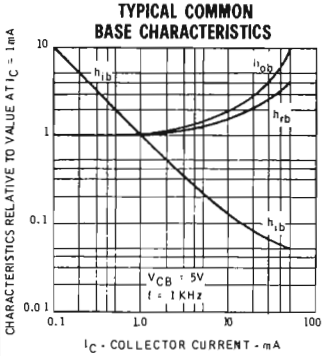
INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



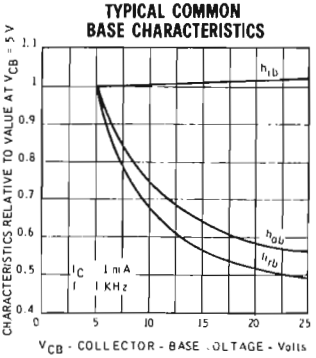
BASE-EMITTER ON VOLTAGE VERSUS COLLECTOR CURRENT



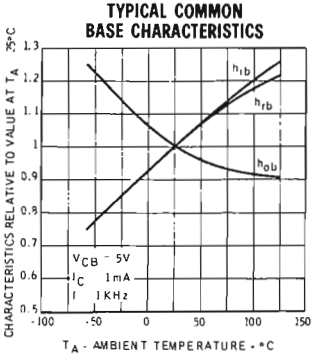
TYPICAL COMMON BASE CHARACTERISTICS



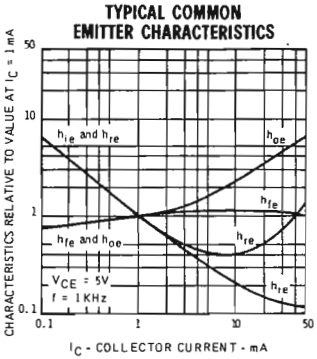
TYPICAL COMMON BASE CHARACTERISTICS

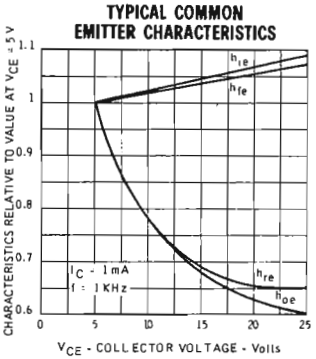


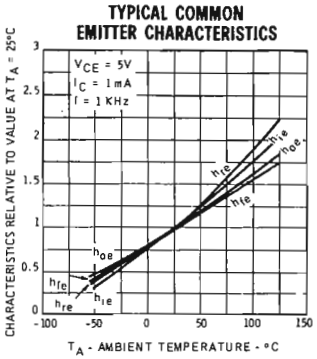
TYPICAL COMMON BASE CHARACTERISTICS

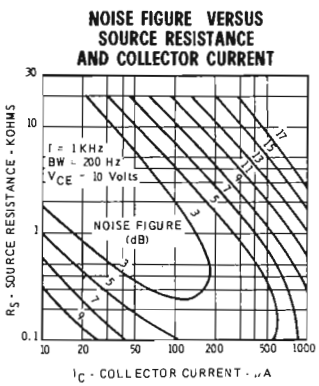


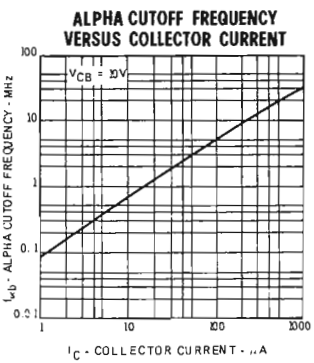
TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)











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-ambient thermal resistance of 350°C/W (derating factor of 2.86 mW/°C) for one side; 292·C/W (derating factor of 3.43 mW/°C) for both sides. Junction-to-case thermal resistance of 117°C/W (derating factor of 8.6 mW/°C) for one side; 58.3°C/W (derating factor of 17.2 mW/°C) for both sides.

(4) These ratings refer to a high current point where collector-to-emitter voltage is lowest. For more information send for SGS-AR 5.

(5) Lowest of two h_{FE} reading is taken as h_{FE1} for purposes of this ratio.

(6) Pulse Conditions ≤ 300 µsec; duty cycle ≤ 1%.

(7) R_S = 1KΩ; Power Bandwidth of 15.7KHz with 3dB points at 25Hz and 10KHz.

(8) f = 1KHz; R_S = 510Ω, Power Bandwidth of 200Hz.