

BFX69-BFX69A

GENERAL PURPOSE AMPLIFIERS

NPN SILICON PLANAR TRANSISTORS

GENERAL DESCRIPTION—The BFX69 is an NPN silicon PLANAR transistor primarily designed for amplifier applications over a wide range of voltage and current.

For Improved performance use the epitaxial BFX69A.

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

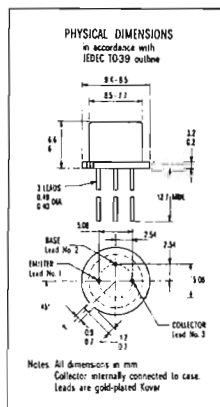
T _{STG}	Storage Temperature	-55°C to +200°C
T _J	Operating Junction Temperature	+200°C
T _L	Lead Temperature (Soldering, 10 sec. time limit)	+260°C

Maximum Power Dissipations (Notes 2 and 3)

P _D	Total Dissipation at 25°C Case Temperature	BFX69	BFX69A
	at 100°C Case Temperature	3 Watts	5 Watts
	at 25°C Ambient Temperature	1.7 Watt	2.8 Watts
		0.8 Watt	0.8 Watt

Maximum Voltages (T_A = 25°C unless otherwise noted)

V _{CB0}	Collector to Base Voltage	75 Volts	80 Volts
V _{CEO}	Collector to Emitter Voltage (Note 4)	30 Volts	40 Volts
V _{CER}	Collector to Emitter Voltage (R _{BE} = 10 Ω) (Note 4)	50 Volts	
V _{EB0}	Emitter to Base Voltage	7 Volts	7 Volts



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

SYMBOL	CHARACTERISTIC	BFX69			BFX69A			UNIT	TEST CONDITIONS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
h _{FE}	DC Current Gain		35		40				I _C = 10 μA V _{CE} = 10 V
h _{FE}	DC Current Gain	20	50		30	60			I _C = 0.1 mA V _{CE} = 10 V
h _{FE}	DC Pulse Current Gain (Note 5)	35	80		40	95			I _C = 10 mA V _{CE} = 10 V
h _{FE}	DC Pulse Current Gain (Note 5)	40	80	120	40	90			I _C = 150 mA V _{CE} = 10 V
h _{FE}	DC Pulse Current Gain (Note 5)	20	55		25	60			I _C = 500 mA V _{CE} = 10 V
h _{FE} (-55°C)	DC Pulse Current Gain (Note 5)	20	35						I _C = 10 mA V _{CE} = 10 V
h _{FE} (-55°C)	DC Pulse Current Gain (Note 5)				20	40			I _C = 150 mA V _{CE} = 10 V
V _{BE} (sat)	Base Saturation Voltage (Note 5)		0.95	1.3		0.86	1.1	V	I _C = 150 mA I _B = 15 mA
V _{BE} (sat)	Base Saturation Voltage (Note 5)						1.8	V	I _C = 500 mA I _B = 50 mA
V _{CE} (sat)	Collector Saturation Voltage (Note 5)	0.6	1.5		0.4	0.8	V	V	I _C = 150 mA I _B = 15 mA
V _{CE} (sat)	Collector Saturation Voltage (Note 5)					1.2	V	V	I _C = 500 mA I _B = 50 mA
I _{EB0}	Emitter Cutoff Current	0.05	10		0.05	10	nA		I _C = 0 V _{EB} = 5 V
I _{CB0}	Collector Cutoff Current	0.3	10		0.4	10	nA		I _E = 0 V _{CB} = 60 V
I _{CB0} (125°C)	Collector Cutoff Current	0.4	10		0.5	10	μA		I _E = 0 V _{CB} = 60 V
BV _{CB0}	Collector to Base Breakdown Voltage	75		80			V		I _E = 0 I _C = 0.1 mA
BV _{EB0}	Emitter to Base Breakdown Voltage	7		7			V		I _E = 0 I _C = 0.1 mA
LV _{CER}	Collector to Emitter Sustaining Voltage (Notes 4 and 5)	50					V		R _{BE} ≤ 10 Ω I _C = 100 mA (pulsed)
LV _{CEO}	Collector to Emitter Sustaining Voltage (Notes 4 and 5)	30		40			V		I _B = 0 I _C = 30 mA (pulsed)

Silicon Planar Transistor **BFX69 • BFX69A**

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

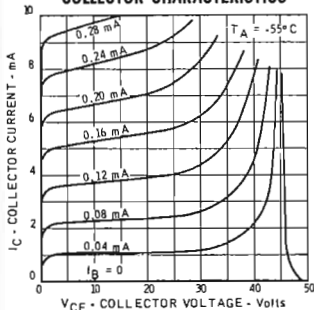
SYMBOL	CHARACTERISTIC	BFX 69			BFX 69A			UNIT	TEST CONDITIONS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
h_{fe}	Small Signal Current Gain ($f = 1 \text{ KHz}$)	30	55	100		70			$I_C = 1 \text{ mA}$ $V_{CE} = 5 \text{ V}$
h_{fe}	Small Signal Current Gain ($f = 1 \text{ KHz}$)	35	70	150					$I_C = 5 \text{ mA}$ $V_{CE} = 10 \text{ V}$
h_{ie}	Input Resistance ($f = 1 \text{ KHz}$)		2.2			1.8		K Ω	$I_C = 1 \text{ mA}$ $V_{CE} = 5 \text{ V}$
h_{oe}	Output Conductance ($f = 1 \text{ KHz}$)		12.5			8		μmho	$I_C = 1 \text{ mA}$ $V_{CE} = 5 \text{ V}$
h_{re}	Voltage Feedback Ratio ($f = 1 \text{ KHz}$)		3.6			2.1		$\times 10^{-4}$	$I_C = 1 \text{ mA}$ $V_{CE} = 5 \text{ V}$
h_{ib}	Input Resistance ($f = 1 \text{ KHz}$)	24	27	34		27		Ω	$I_C = 1 \text{ mA}$ $V_{CB} = 5 \text{ V}$
h_{ib}	Input Resistance ($f = 1 \text{ KHz}$)	4	6.3	8				Ω	$I_C = 5 \text{ mA}$ $V_{CB} = 10 \text{ V}$
h_{ob}	Output Conductance ($f = 1 \text{ KHz}$)	0.1	0.16	0.5		0.12		μmho	$I_C = 1 \text{ mA}$ $V_{CB} = 5 \text{ V}$
h_{ob}	Output Conductance ($f = 1 \text{ KHz}$)	0.1	0.19	1				μmho	$I_C = 5 \text{ mA}$ $V_{CB} = 10 \text{ V}$
h_{rb}	Voltage Feedback Ratio ($f = 1 \text{ KHz}$)		0.7	3		0.5		$\times 10^{-4}$	$I_C = 1 \text{ mA}$ $V_{CB} = 5 \text{ V}$
h_{rb}	Voltage Feedback Ratio ($f = 1 \text{ KHz}$)		0.8	3				$\times 10^{-4}$	$I_C = 5 \text{ mA}$ $V_{CB} = 10 \text{ V}$
h_{fe}	High Frequency Current Gain ($f = 20 \text{ MHz}$)	3	4		3	4.2			$I_C = 50 \text{ mA}$ $V_{CE} = 10 \text{ V}$
C_{TE}	Emitter Transition Capacitance		50	80		62	80	pF	$I_C = 0$ $V_{EB} = 0.5 \text{ V}$
C_{obo}	Common Base, Open Circuit, Output Capacitance		18	25		13	20	pF	$I_E = 0$ $V_{CB} = 10 \text{ V}$
NF	Narrow Band Noise Figure (Note 6)		6	12				dB	$I_C = 0.3 \text{ mA}$ $V_{CE} = 10 \text{ V}$
NF	Narrow Band Noise Figure (Note 7)					3.5	7	dB	$I_C = 30 \mu\text{A}$ $V_{CE} = 10 \text{ V}$

NOTES:

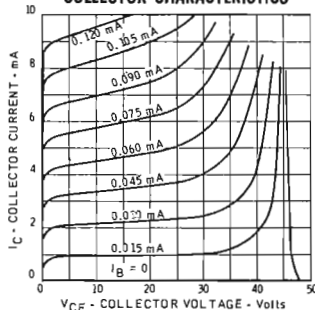
- (1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
- (2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
- (3) (BFX 69 only) These ratings give a maximum junction temperature of 200°C and junction-to-case thermal resistance of 58.3°C/watt (derating factor of 17.2 mW/°C); junction-to-ambient thermal resistance of 219°C/watt (derating factor of 4.55 mW/°C).
(BFX 69A only) These ratings give a maximum junction temperature of 200°C and junction-to-case thermal resistance of 35°C/watt (derating factor of 28.6 mW/°C); junction-to-ambient thermal resistance of 218°C/watt (derating factor of 4.6 mW/°C).
- (4) These ratings refers to a high-current point where collector-to-emitter voltage is lowest. For more information send for SGS-AR 5.
- (5) Pulse Conditions: length = 300 μsec ; duty cycle = 1%.
- (6) $f = 1 \text{ KHz}$; $R_S = 510 \Omega$; Power Bandwidth of 200 Hz.
- (7) $f = 1 \text{ KHz}$; $R_S = 1 \text{ K}\Omega$; Power Bandwidth of 200 Hz.

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

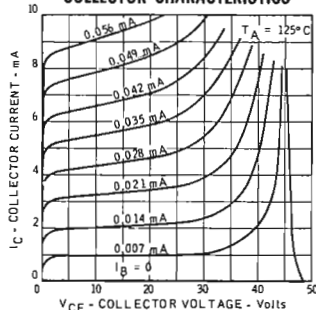
COLLECTOR CHARACTERISTICS*



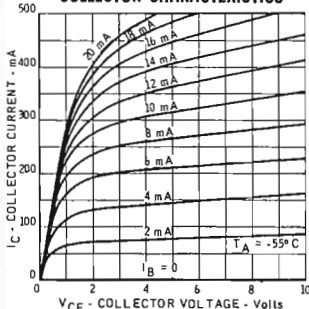
COLLECTOR CHARACTERISTICS*



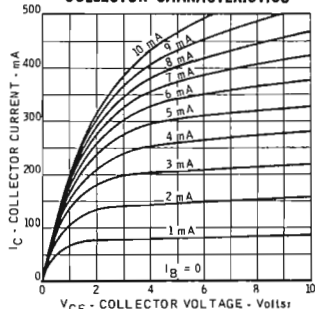
COLLECTOR CHARACTERISTICS*



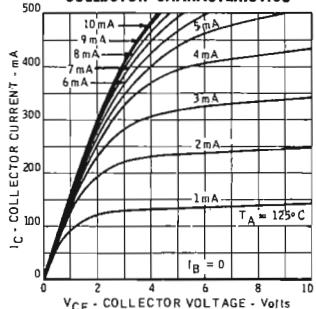
COLLECTOR CHARACTERISTICS*



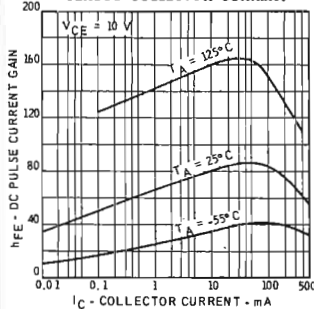
COLLECTOR CHARACTERISTICS*



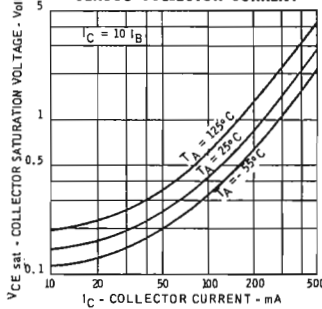
COLLECTOR CHARACTERISTICS*



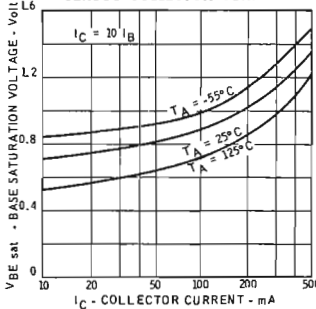
**DC PULSE CURRENT GAIN
VERSUS COLLECTOR CURRENT**



**COLLECTOR SATURATION VOLTAGE
VERSUS COLLECTOR CURRENT**

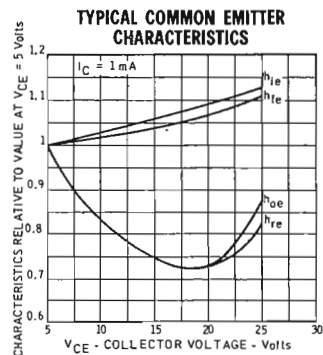
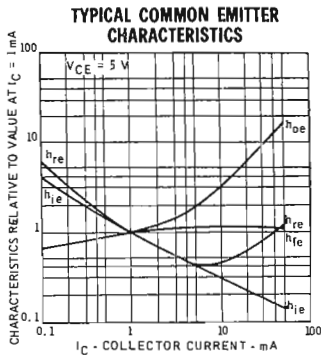
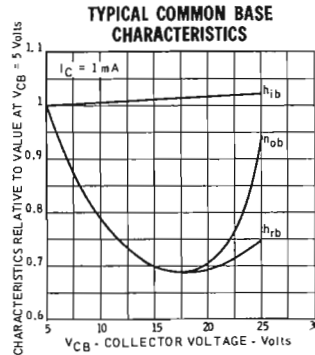
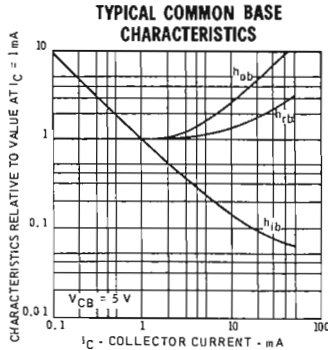
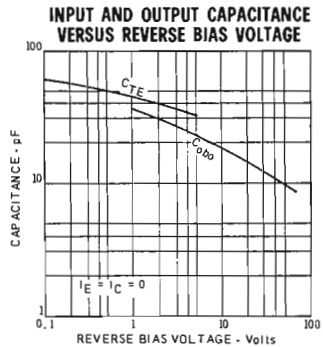
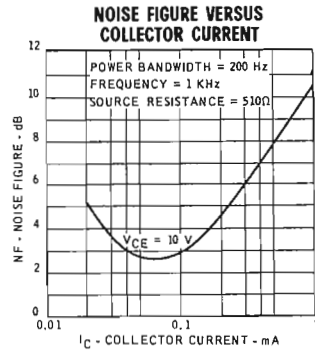
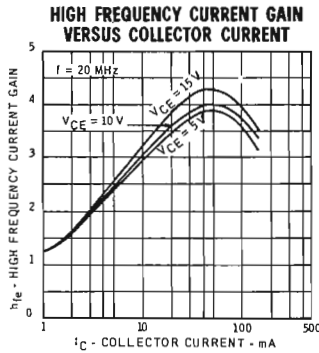
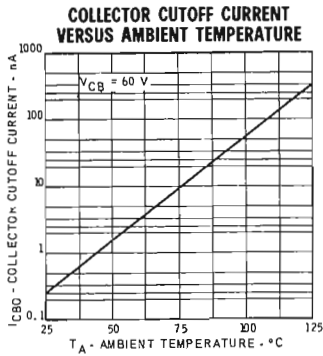


**BASE SATURATION VOLTAGE
VERSUS COLLECTOR CURRENT**

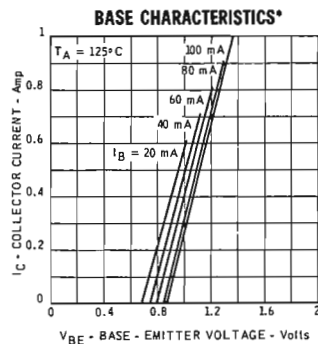
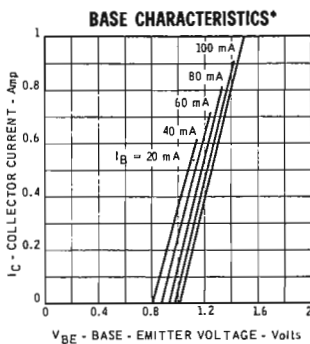
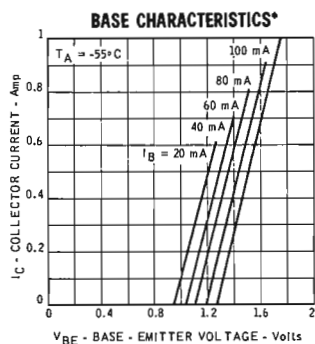
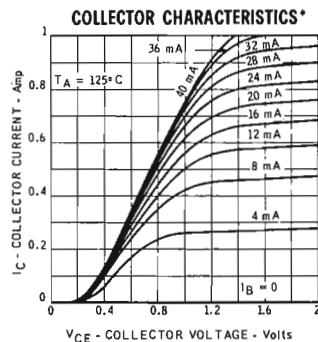
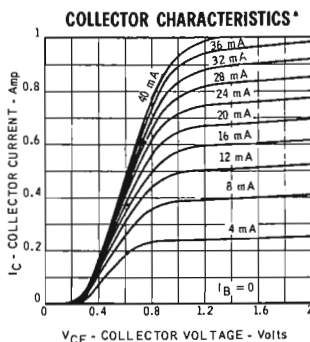
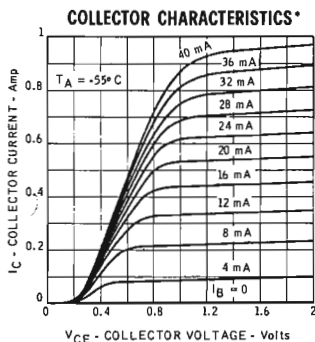
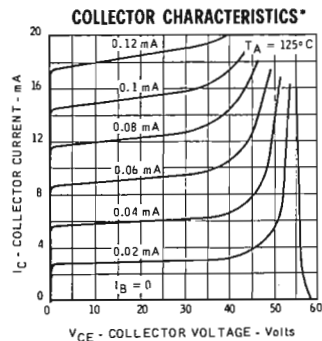
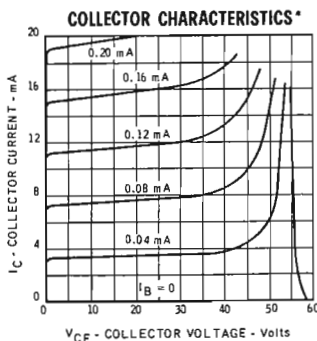
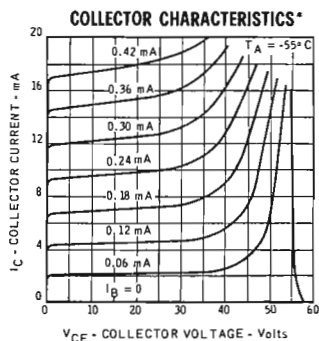


* Single family characteristics on Transistor Curve Tracer.

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



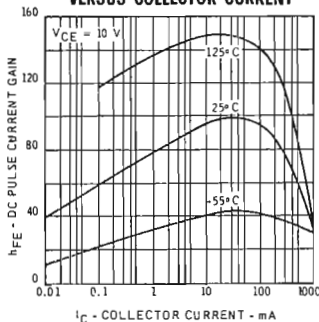
TYPICAL ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)



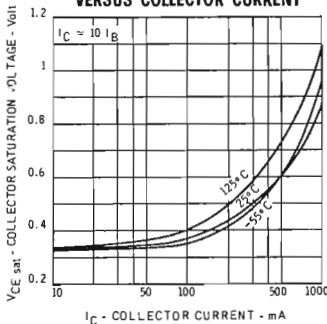
*Single family characteristics on Transistor Curve Tracer.

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

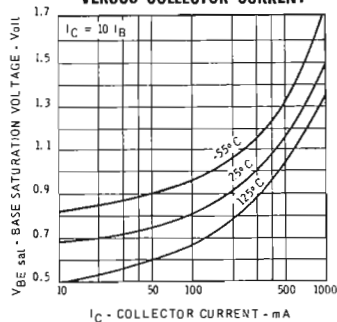
**DC PULSE CURRENT GAIN
VERSUS COLLECTOR CURRENT**



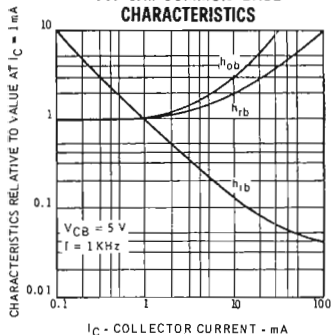
**COLLECTOR SATURATION VOLTAGE
VERSUS COLLECTOR CURRENT**



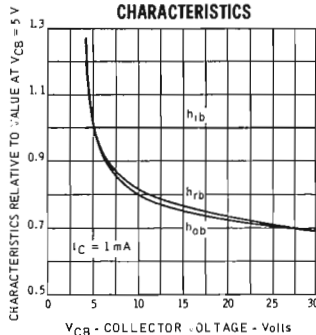
**BASE SATURATION VOLTAGE
VERSUS COLLECTOR CURRENT**



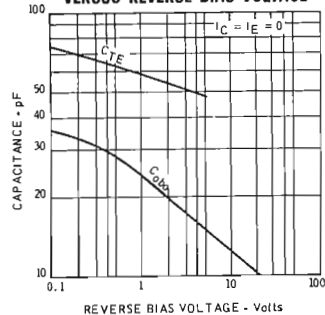
**TYPICAL COMMON BASE
CHARACTERISTICS**



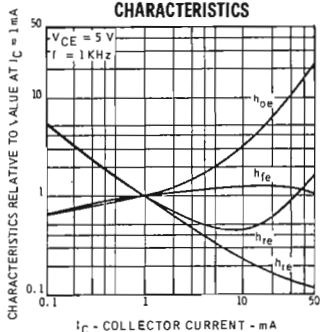
**TYPICAL COMMON BASE
CHARACTERISTICS**



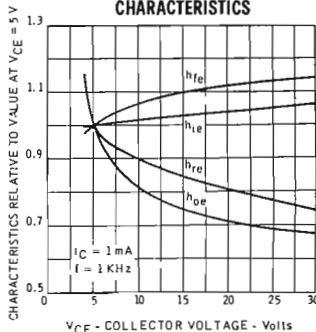
**INPUT AND OUTPUT CAPACITANCE
VERSUS REVERSE BIAS VOLTAGE**



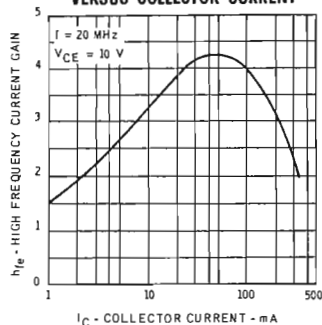
**TYPICAL COMMON EMITTER
CHARACTERISTICS**



**TYPICAL COMMON EMITTER
CHARACTERISTICS**



**HIGH FREQUENCY CURRENT GAIN
VERSUS COLLECTOR CURRENT**



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

* Single family characteristics on Transistor Curve Tracer.

