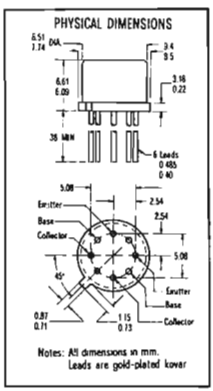
BFX 36

DUAL HIGH-GAIN, LOW-NOISE DIFFERENTIAL AMPLIFIER

PNP DIFFUSED SILICON PLANAR EPITAXIAL TRANSISTORS

GENERAL DESCRIPTION - The BFX 36 is a six-terminal device containing two isolated high-gain, low-noise, PNP silicon PLANAR epitaxial transistors in one hermetically sealed enclosure. They are designed for use in high performance amplifier and differential amplifier circuits requiring high-gain and low-noise in a very wide current range, from 1 µA up to 100 mA.



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	-65°C to + 200°C
Operating Junction Temperature	+200°C Maximum
Lead Temperature (Soldering, 60 sec time limit)	+300°C Maximum

Maximum Power Dissipations

	One Side	Both Sides
Total Dissipation at 25°C Case Temperature (Notes 2 and 3)	0.80 Watt	1.3 Watt
at 25°C Ambient Temperature (Notes 2 and 3)	0.40 Watt	0.6 Watt

Maximum Voltages for Each Transistor

V_{CBO}	Collector to Base Voltage	-60 Volts
V_{CEO}	Collector to Emitter Voltage (Note 4)	-60 Volts
V_{EBO}	Emitter to Base Voltage	-6 Volts

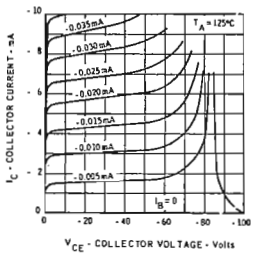
ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS	
h_{FE}	DC Current Gain	60	140			I_C = 1 µA	V_{CE} = - 5 V
h_{FE}	DC Current Gain	100	160	300		I_C = 10 µA	V_{CE} = - 5 V
h_{FE}	DC Current Gain	100	180			I_C = 100 µA	V_{CE} = - 5 V
h_{FE}	DC Current Gain	100	200			I_C = 1 mA	V_{CE} = - 5 V
h_{FE} (-55°C)	DC Pulse Current Gain (Note 5)	40	90			I_C = 10 µA	V_{CE} = - 5 V
h_{FE}	DC Pulse Current Gain (Note 5)	90	190			I_C = 50 mA	V_{CE} = - 5 V
V_{BE} (sat)	Base-Emitter Saturation Voltage			-0.9	V	I_C = 10 mA	I_B = 0.5 mA
V_{BE} (sat)	Base-Emitter Saturation Voltage		-0.85	-0.95	V	I_C = 50 mA	I_B = 5 mA
V_{CE} (sat)	Collector-Emitter Saturation Voltage			-0.25	V	I_C = 10 mA	I_B = 0.5 mA
V_{CE} (sat)	Collector-Emitter Saturation Voltage		-0.14	-0.4	V	I_C = 50 mA	I_B = 5 mA
I_{EBO}	Emitter Cutoff Current			10	nA	I_C = 0	V_{EB} = - 4 V
I_{CBO}	Collector Cutoff Current		0.5	10	nA	I_E = 0	V_{CB} = - 50 V
I_{CBO} (125°C)	Collector Cutoff Current		0.5	10	µA	I_E = 0	V_{CB} = - 50 V
BV_{CBO}	Collector to Base Breakdown Voltage	-60			V	I_C = 10 µA	I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	-6			V	I_E = 10 µA	I_C = 0
V_{CEO} (sust)	Collector to Emitter Sustaining Voltage (Notes 4 and 5)	-60			V	I_C = 5 mA (pulsed)	I_B = 0
h_{ie}	Input Resistance (f = 1 Kc/s)	2.5	5.7	20	KΩ	I_C = 1 mA	V_{CE} = - 5 V
h_{oe}	Output Conductance (f = 1 Kc/s)	5	22	50	µmho	I_C = 1 mA	V_{CE} = - 5 V
h_{re}	Voltage Feedback Ratio (f = 1 Kc/s)		2.9	10	$\times 10^{-4}$	I_C = 1 mA	V_{CE} = - 5 V
h_{fe}	High Frequency Current Gain (f = 20 Mc/s)	2	5.5	8		I_C = 1 mA	V_{CE} = - 5 V
C_{ob}	Output Capacitance		5	6	pF	I_E = 0	V_{CB} = - 5 V
NF	Narrow Band Noise Figure (Note 6)			3	dB	I_C = 20 µA	V_{CE} = - 5 V
NF	Narrow Band Noise Figure (Note 7)			10	dB	I_C = 20 µA	V_{CE} = - 5 V
h_{FE1}/h_{FE2}	DC Current Gain Ratio (Note 8)	0.9		1		I_C = 100 µA	V_{CE} = - 5 V
$\lvert V_{BE1}-V_{BE2}\rvert$	Base Voltage Differential			3	mV	I_C = 100 µA	V_{CE} = - 5 V
$\lvert V_{BE1}-V_{BE2}\rvert/\Delta T$	Base Voltage Differential Change			10	µV/°C	I_C = 100 µA	V_{CE} = - 5 V

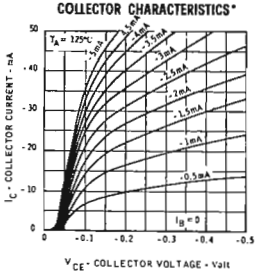
TYPICAL ELECTRICAL CHARACTERISTICS - ONE SIDE

(25° C free air temperature unless otherwise noted)

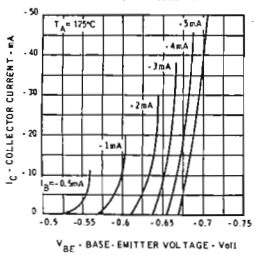
COLLECTOR CHARACTERISTICS*



COLLECTOR CHARACTERISTICS*



BASE CHARACTERISTICS*



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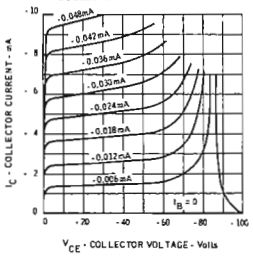

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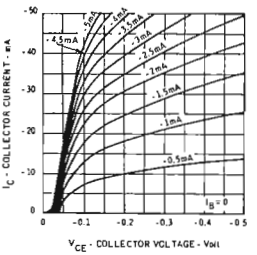
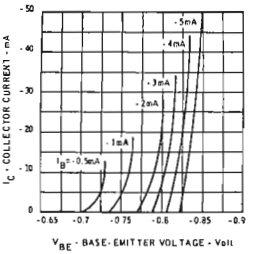


BASE CHARACTERISTICS*



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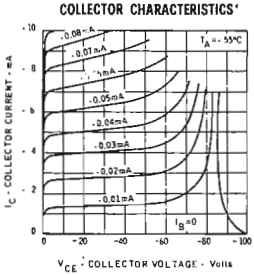

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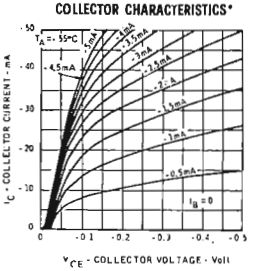

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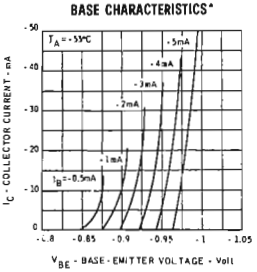
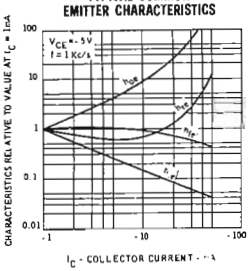
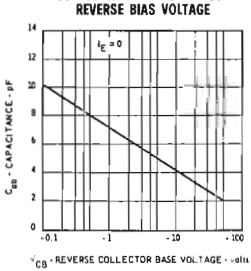


TYPICAL COMMON EMITTER CHARACTERISTICS



OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE

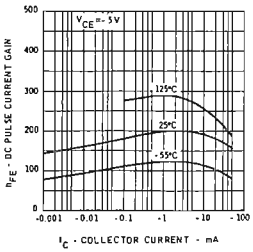


* Single family characteristics on Transistor Curve Tracer.

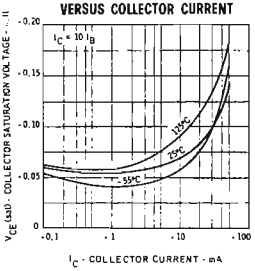
TYPICAL ELECTRICAL CHARACTERISTICS - ONE SIDE

(25° C free air temperature unless otherwise noted)

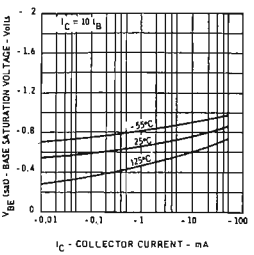
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



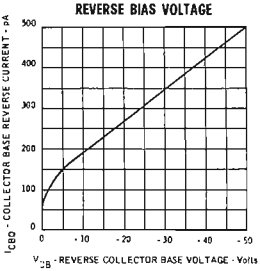
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



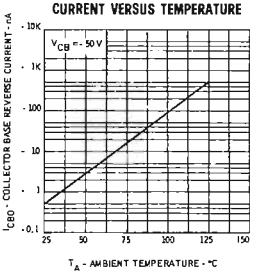
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



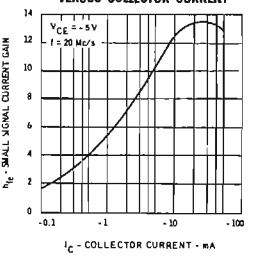
COLLECTOR-BASE REVERSE CURRENT VERSUS REVERSE BIAS VOLTAGE



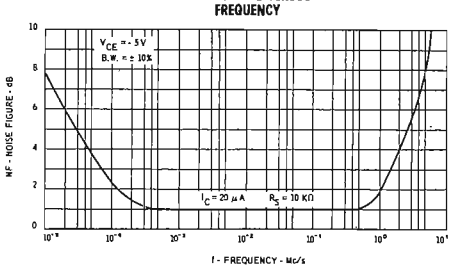
COLLECTOR-BASE REVERSE CURRENT VERSUS TEMPERATURE



SMALL SIGNAL CURRENT GAIN AT 20 Mc/s VERSUS COLLECTOR CURRENT



NOISE FIGURE VERSUS FREQUENCY



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 220°C/W (derating factor of 4.55 mW/°C) for one side, and junction-to-case thermal resistance of 135°C/W (derating factor of 7.4 mW/°C) for both sides; junction-to-ambient thermal resistance of 440°C/W (derating factor of 2.26 mW/°C) for one side, and junction-to-ambient thermal resistance of 293°C/W (derating factor of 3.42 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) Pulse Conditions: length = 300 μsec; duty cycle = 1%.

(6) f = 1 Kc/s; R_S = 10 KΩ; Power Bandwidth of 200 cps.

(7) f = 100 cps; R_S = 10 KΩ; Power Bandwidth of 20 cps.

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