CATV ultra-linear high gain transistor

The BFR 36 is a NPN multi-emitter silicon planar epitaxial transistor particularly suited for CATV-MATV amplifier application in a wide frequency range (40 - 860MHz).
It features :

- Very good intermodulation properties
- Very low feedback capacitance (C_{re} = 1.7pF)
- High power gain (16dB at 200 MHz)
- High power dissipation

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted)

Symbol	Characteristic and test conditions		Min.	Typ.	Max.	Unit
h_{FE}	DC Current Gain (5)					
	I_C = 70mA	V_{CE} = 5V	60	130		
	I_C = 150mA	V_{CE} = 5V	60			
	I_C = 70mA	V_{CE} = 15V	65			
	I_C = 150mA	V_{CE} = 15V	65			
V_{BEon}	Base-Emitter On Voltage					
	I_C = 70mA	V_{CE} = 5V		750		mV
I_{CBO}	Collector Reverse Current					
	V_{CB} = 20V I_E = 0	T_A = 25°C			150	nA
		T_A = 150°C			20	µA
BV_{CBO}	Collector to Base Breakdown Voltage					
	I_C = 100 µA I_E = 0		40			V
BV_{EBO}	Emitter to Base Breakdown Voltage					
	I_E = 100 µA I_C = 0		3			V
LV_{CEO}	Collector to Emitter Sustaining Voltage (4 and 5)					
	I_C = 10 mA I_B = 0		30			V
C_{re}	Reverse Transfer Capacitance					
	I_C = 0 V_{CE} = 15V	f = 1MHz		1.7	2.2	pF
C_{obo}	Base-Collector Capacitance					
	I_E = 0 V_{CB} = 15V	f = 1MHz			3	pF
h_{fe}	High Frequency Current Gain					
	I_C = 70mA V_{CE} = 15V	f = 100MHz	10	14		
	I_C = 150mA V_{CE} = 15V	f = 100MHz		12		
P_G	Power Gain (not neutralized)					
	I_C = 70mA V_{CE} = 18V	f = 200MHz		16		dB
		f = 500MHz		9.5		dB
		f = 800MHz		6.5		dB
P_o	Power Output (7 and 9)					
	I_C = 70mA V_{CE} = 18V	f = 200MHz	130	150		mW
	(8 and 9)	f = 800MHz	70	90		mW
NF	Noise Figure (f = 200 MHz),					
	I_C = 30mA V_{CE} = 15V	R_S = 50Ω		4		dB
	I_C = 70mA V_{CE} = 15V	R_S = 50Ω		4.5		dB
V_{CEK}	Knee Voltage					
	I_C = 100mA I_B = value for which I_C = 110mA at V_{CE} = 1V			700	750	mV
C_{TE}	Emitter Transition Capacitance					
	I_C = 0 V_{BE} = 0.4V	f = 1MHz		7		pF

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 30°C/W (derating factor of 33.3 mW/°C); junction-to-ambient thermal resistance of 200°C/W (derating factor of 5 mW/°C).
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) Measured under pulse conditions : pulse length = 300 µsec; duty cycle = 1%.
6) See switching circuits for exact values of I_C, I_{B1} and I_{B2}.
7) V.S.W.R. at output 2; f_p = 202MHz; f_q = 205MHz; dim = -30dB measured at f(2 q-p) 208MHz (channel 9).
8) V.S.W.R. at output 2; f_p = 798MHz; f_q = 802MHz; dim = -30dB measured at f(2 q-p) = 806MHz (channel 62).
9) See test circuit.

ABSOLUTE MAXIMUM RATINGS (1)

(T_A = 25°C unless otherwise noted)

Voltages and Currents

Collector to Base	V_{CBO}	40 V
Collector to Emitter (4)	V_{CEO}	30 V
Emitter to Base	V_{EBO}	3 V
DC Collector Current	I_C	200 mA
Collector Peak Current	I_{CM}	400 mA

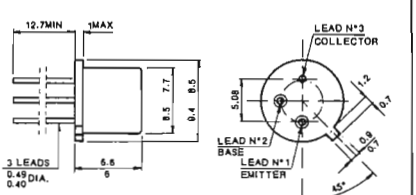
Temperatures

Storage Temperature Range	-55°C to + 200°C
Operating Junction Temperature	+ 200°C

Power (2 and 3)

Dissipation at 50°C Case Temperature	P_D	5 W
Dissipation at 40°C Ambient Temperature	P_D	0.8 W

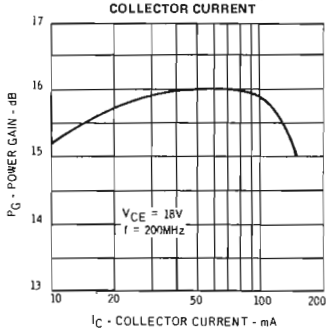
PHYSICAL DIMENSIONS
in accordance with
JEDEC TO-39 outline



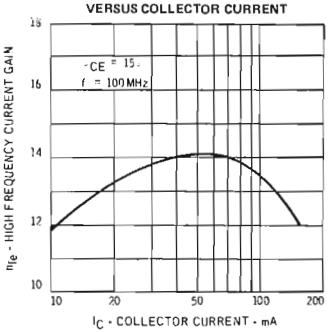
Notes: All dimensions in mm.
Collector internally connected to case.

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

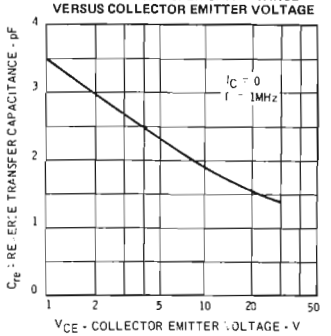
TYPICAL POWER GAIN VERSUS COLLECTOR CURRENT



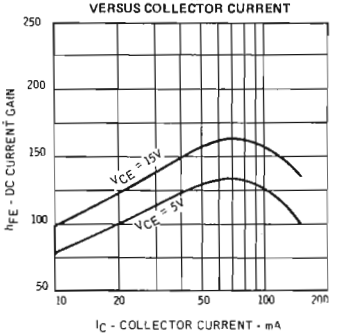
HIGH FREQUENCY CURRENT GAIN VERSUS COLLECTOR CURRENT



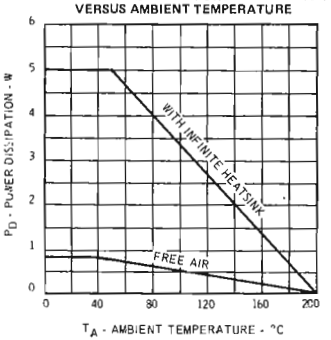
REVERSE TRANSFER CAPACITANCE VERSUS COLLECTOR EMITTER VOLTAGE



DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT

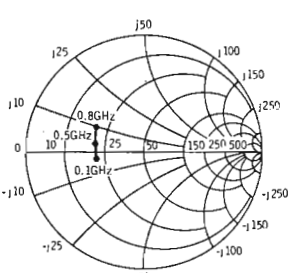


MAXIMUM ALLOWABLE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

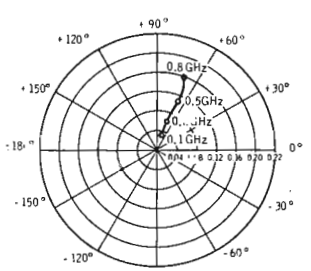


TYPICAL COMMON EMITTER S-PARAMETERS
(V_{CE} = 18V; I_C = 70mA; T_A = 25°C)

INPUT IMPEDANCE $S_{11\,E}$ (Ω)

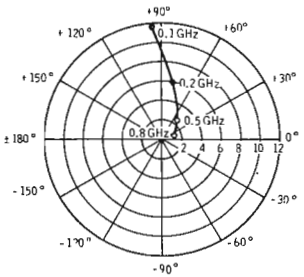


REVERSE TRANSFER COEFFICIENT $S_{12\,E}$

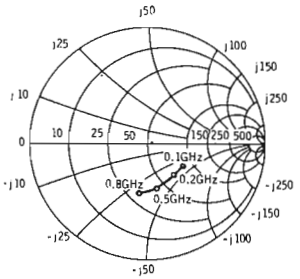


TYPICAL COMMON EMITTER S-PARAMETERS
(V_{CE} = 18V; I_C = 70mA; T_A = 25°C)

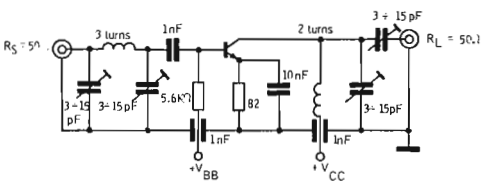
FORWARD TRANSFER COEFFICIENT $S_{21\,E}$



OUTPUT IMPEDANCE $S_{22\,E}$ (Ω)

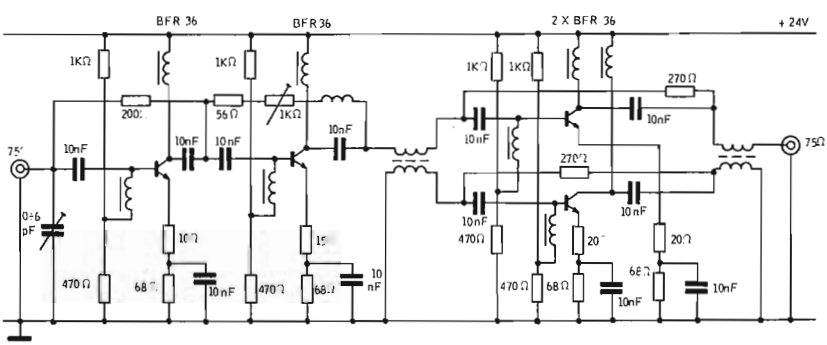


RF AMPLIFIER CIRCUIT FOR POWER GAIN TEST (f = 200 MHz)



TYPICAL APPLICATIONS :

CATV – EXTENDER LINE AMPLIFIER



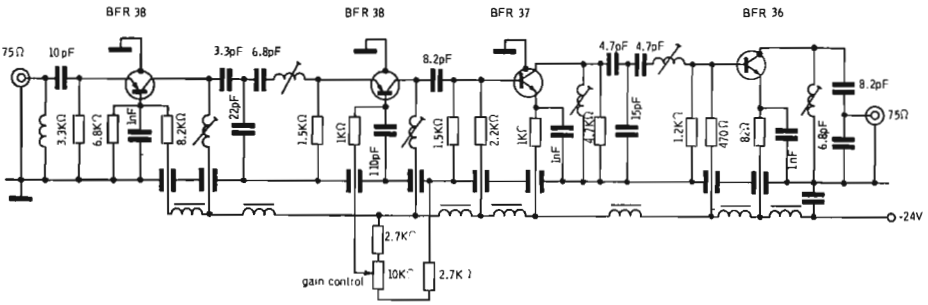
Second order distortion at V_{OUT} = + 46dBmV:

BW_{-3dB} = 10 ÷ 350MHz
P.G. = 25dB

d_{f1+f2} = -61dB f1 = 159MHz
d_{f1-f2} = -66dB f2 = 57MHz

TYPICAL APPLICATIONS (Contd.)

MATV - 200 MHz CHANNEL AMPLIFIER



Supply Voltage : -24V
Current Drain : 110mA
P.G. : 70dB
N.F. : 3dB

$V.S.W.R._{IN}$: <1.5
$V.S.W.R._{OUT}$: < 2
P_{OUT} = 120mW at dim = -30dB
Gain Control : >30dB