BFR 36

MULTI-EMITTER SILICON PLANAR NPN

CATV ULTRA-LINEAR HIGH-GAIN TRANSISTOR

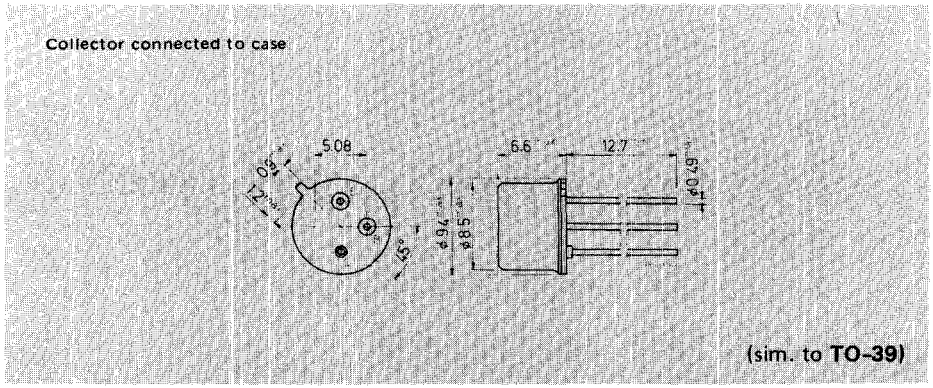
The BFR36 is a multi-emitter silicon planar epitaxial NPN transistor in Jedec TO-39 metal case. It is designed for CATV-MATV amplifier applications over a wide frequency range (40 to 860 MHz). The device features very good intermodulation properties, very low reverse capacitance, high power gain and high power dissipation.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	40	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	30	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	3	V
I_C	Collector current	200	mA
I_{CM}	Collector peak current	400	mA
P_{tot}	Total power dissipation at $T_{amb} \leqslant 40°C$	0.8	W
	at $T_{case} \leqslant 50°C$	5	W
T_{stg}, T_j	Storage and junction temperature	-55 to 200	°C

MECHANICAL DATA

Dimensions in mm



THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	30	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	200	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C unless otherwise specified)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 20V				150	nA
		V_{CB} = 20V	T_{amb} = 150°C			20	μA
$V_{(BR)CBO}$	Collector-base breakdown voltage (I_E = 0)	I_C = 100μA		40			V
$V_{CEO(sus)}$ *	Collector-emitter sustaining voltage (I_B = 0)	I_C = 10mA		30			V
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C = 0)	I_E = 100μA		3			V
V_{CEK} **	Collector-emitter knee voltage	I_C = 100mA			700	750	mV
V_{BE}	Base-emitter voltage	I_C = 70mA	V_{CE} = 5V		750		mV
h_{FE} *	DC current gain	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			–
f_T	Transition frequency	V_{CE} = 15V	f = 100MHz				
			I_C = 70mA	1	1.4		GHz
			I_C = 150mA		1.2		GHz
C_{EBO}	Emitter-base capacitance	I_C = 0	V_{EB} = 0.4V				
		f = 1MHz			7		pF

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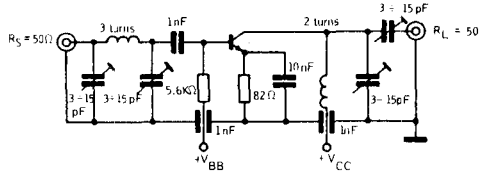
ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
C_{CBO}	Collector-base capacitance	$I_E = 0$ $f = 1MHz$	$V_{CB} = 15V$			3	pF
$-C_{re}$	Reverse capacitance	$I_C = 0$ $f = 1MHz$	$V_{CE} = 15V$		1.7	2.2	pF
NF	Noise figure	$V_{CE} = 15V$ $f = 200$ MHz	$Rg = 50\ \Omega$				
			$I_C = 30mA$		4		dB
			$I_C = 70mA$		4.5		dB
G_{pe}	Power gain (see test circuit)	$I_C = 70mA$	$V_{CE} = 18V$				
			$f = 200MHz$		16		dB
			$f = 500MHz$		9.5		dB
			$f = 800MHz$		6.5		dB
P_o (1)	Output power (see test circuit)	$I_C = 70mA$	$V_{CE} = 18V$				
			$f = 200MHz$	130	150		mW
			$f = 800MHz$	70	90		mW

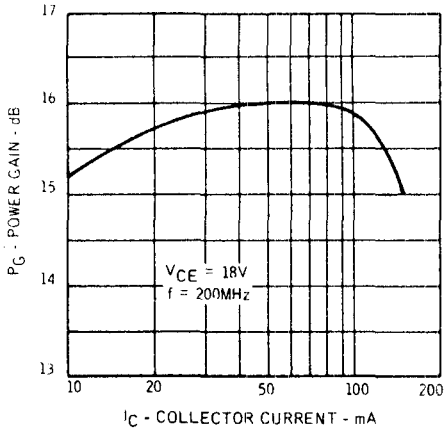
* Pulsed: pulse duration = 300μs, duty cycle = 1%
** I_B = Value corresponding to I_C = 110mA and V_{CE} = 1V
(1)Output VSWR < 2, d_{im} = -30 dB @ f = 2 (f_q-f_p), f_p=798MHz and f_q=802MHz

TEST CIRCUIT

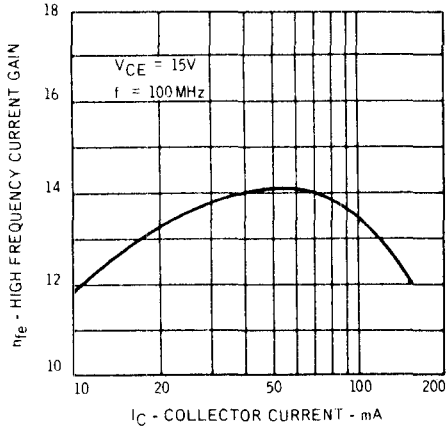
RF amplifier circuit for power gain test (f = 200 MHz)



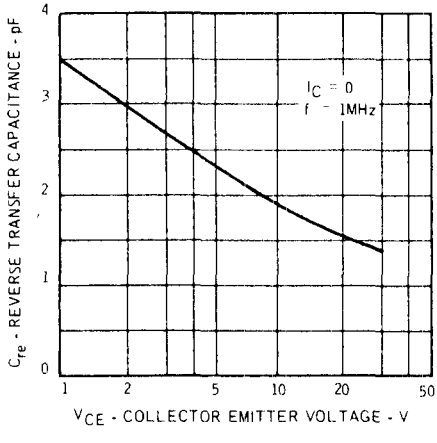
Power gain



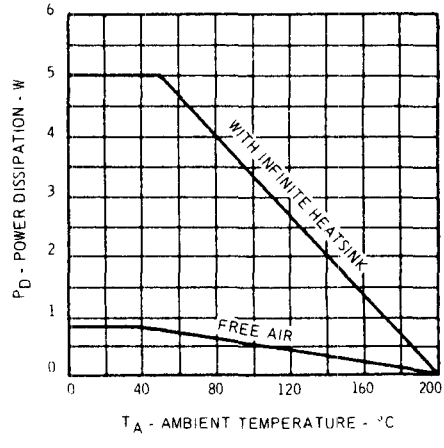
High frequency current gain



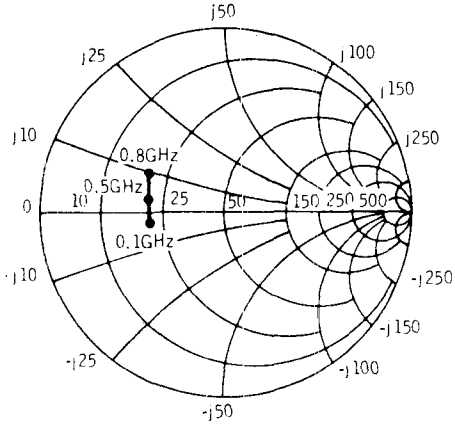
Reverse capacitance



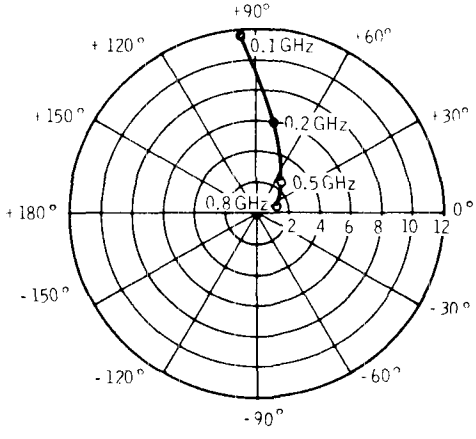
Power rating chart



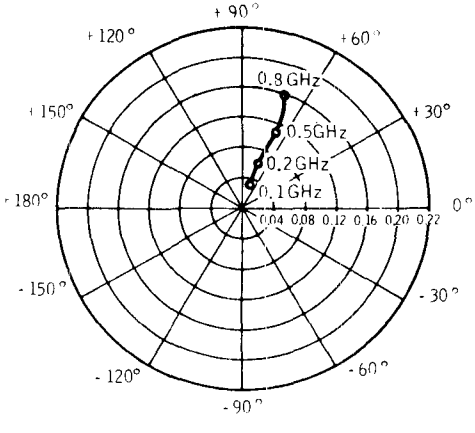
Input impedance S_{11e} (Ω)



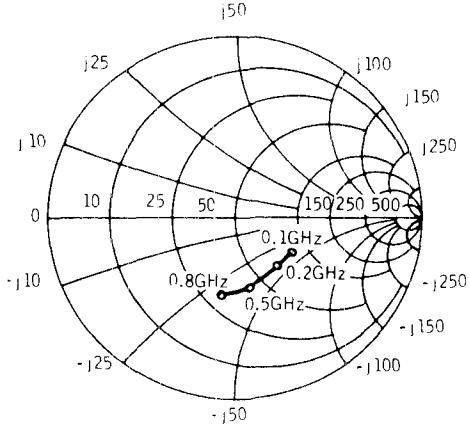
Forward transfer coefficient S_{21e}



Reverse transfer coefficient S_{12e}

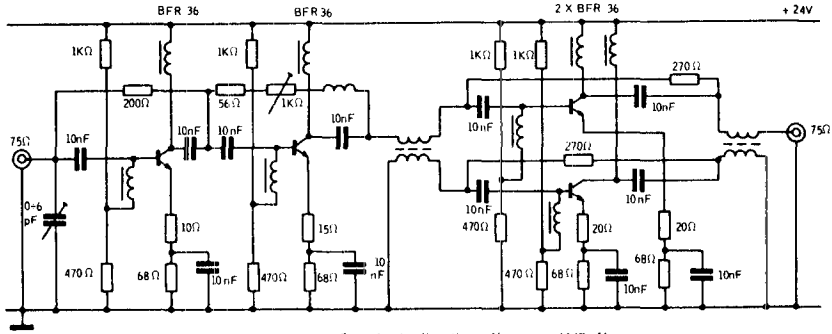


Output impedance (Ω)



TYPICAL APPLICATIONS

CATV-extender line amplifier

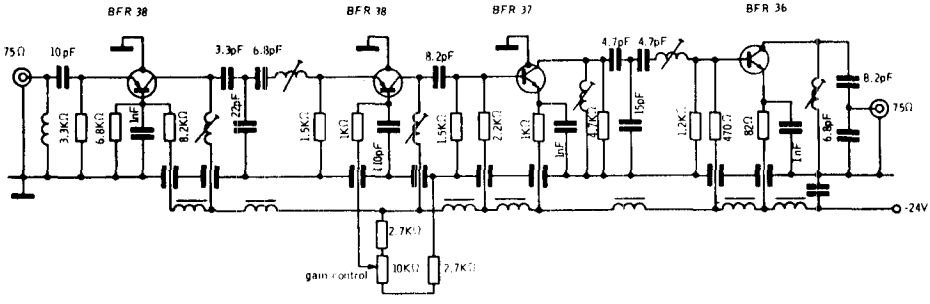


Second order distortion at V_{OUT} = +46dBmV:

BW_{-3dB} = 10 ÷ 350MHz
P.G. = 25dB

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

MATV-200 MHz channel amplifier



Supply Voltage	-24V	V.S.W.R $_{IN}$	<1.5
Current Drain	110mA	V.S.W.R $_{OUT}$	<2
P.G.	70dB	P_{OUT} 120mW at dim	-30dB
N.F.	3dB	Gain Control	>30dB