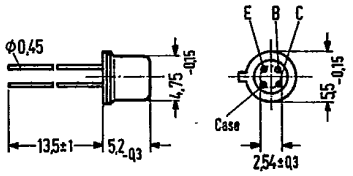
PNP Germanium RF Transistor AF 239

SIEMENS AKTIENGESELLSCHAF — T-31-07

for UHF input stages up to 900 MHz

AF 239 is a germanium PNP mesa transistor in TO 72 case (18 A 4 DIN 41876). The leads are electrically insulated from the case.

Type	Ordering code
AF 239	Q60106-X239



Approx. weight 0.4 g — Dimensions in mm

Maximum ratings

Collector-emitter voltage	$-V_{CEO}$	15	V
Collector-emitter voltage	$-V_{CES}$	20	V
Emitter-base voltage	$-V_{EBO}$	0.3	V
Collector current	$-I_C$	10	mA
Emitter current	I_E	11	mA
Base current	$-I_B$	1	mA
Junction temperature	T_j	90	°C
Storage temperature range	T_{stg}	−30 to +75	°C
Total power dissipation (T_{amb} = 45 °C)	P_{tot}	60	mW

Thermal resistance

Junction to ambient air	R_{thJA}	≤750	K/W
Junction to case	R_{thJC}	≤400	K/W

Static characteristics (T_{amb} = 25 °C)

For the operating point, the following data applies:

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ µA	h_{FE} I_C/I_B	$-V_{BE}$ mV
10	2	40	50 (>10)	350
5	5	120	42	400

Collector cutoff current	($-V_{CES}$ = 20 V)	$-I_{CES}$	0.5 (<8)	µA
Collector cutoff current	($-V_{CEO}$ = 15 V)	$-I_{CEO}$	<500	µA
Emitter cutoff current	($-V_{EBO}$ = 0.3 V)	$-I_{EBO}$	<100	µA

Dynamic characteristics (T_{amb} = 25 °C)

Transition frequency ($-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 100 MHz)	f_T	700	MHz
Reverse transfer capacitance ($-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 450 kHz)	$-C_{12e}$	0.23	pF
Operating point: $-I_C$ = 2 mA; $-V_{CB}$ = 10 V			
Power gain (common base configuration)			
(f = 800 MHz; R_L = 500 Ω)	G_{pb}	11.5 (>9)	dB
(f = 800 MHz; R_L = 2 kΩ)	G_{pb}	14.5 (>11.5)	dB
(f = 900 MHz; R_L = 500 Ω)	G_{pb}	10.5 (≧8.5)	dB
(f = 900 MHz; R_L = 2 kΩ)	G_{pb}	12.5	dB
Noise figure			
(f = 800 MHz; R_g = 60 Ω)	NF	5 (<6)	dB
(f = 900 MHz; R_g = 60 Ω)	NF	6 (<7)	dB

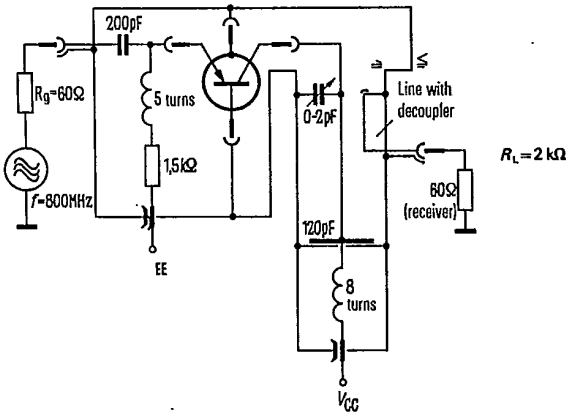
Four-pole characteristics ($-I_C$ = 2 mA; $-V_{CE}$ = 10 V; measuring plane 5 mm below case bottom) f = 200 MHz

g_{11b} = 45 mS	$\lvert y_{12b}\rvert$ = 0,09 mS	$\lvert y_{21b}\rvert$ = 52 mS	g_{22b} = 0,05 ms
$-b_{11b}$ = 29 mS	φ_{12b} = −90°	φ_{21b} = 135°	b_{22b} = 1,6 mS

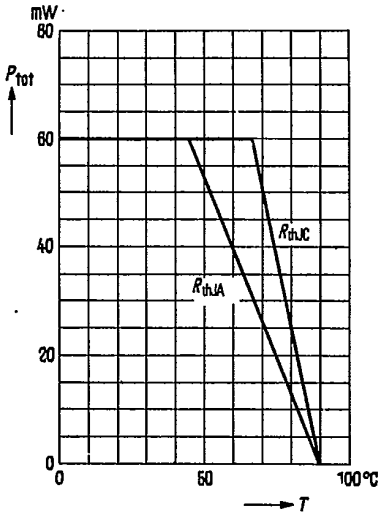
f = 800 MHz

g_{11b} = 2 mS	$\lvert y_{12b}\rvert$ = 0,38 ms	$\lvert y_{21b}\rvert$ = 20 mS	g_{22b} = 0,5 mS
$-b_{11b}$ = 17,5 mS	φ_{12b} = −100°	φ_{21b} = 37°	b_{22b} = 6,3 mS

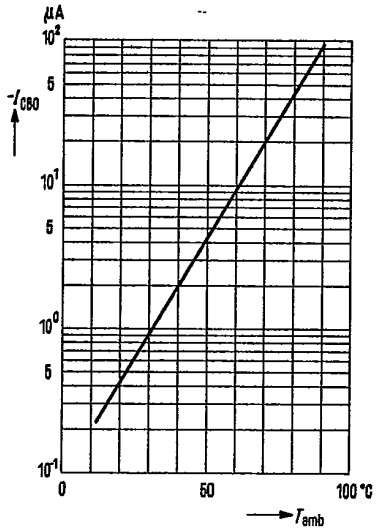
Test circuit for power gain and noise figure at f = 800 MHz



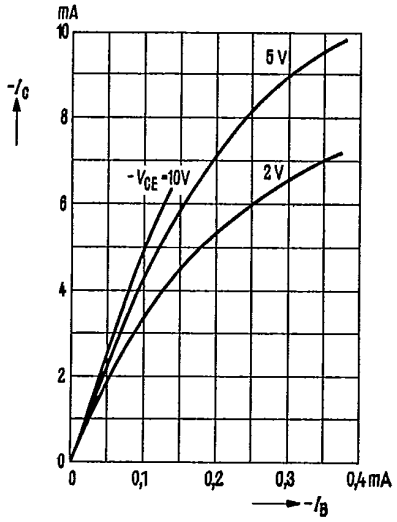
Total perm. power dissipation versus temperature
$P_{tot} = f(T)$; R_{th} = parameter



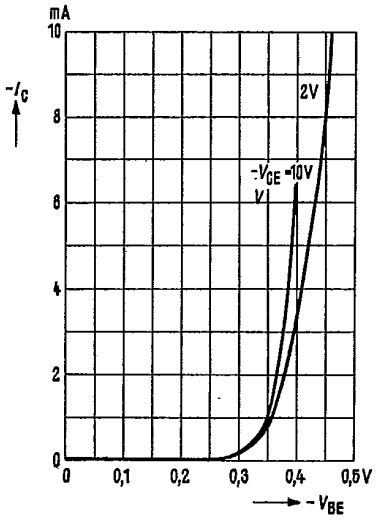
Collector cutoff current versus temperature $I_{CBO} = f(T_{amb})$
$-V_{CBO} = 20\,V$



Collector current $I_C = f(I_B)$
V_{CE} = parameter
(common emitter configuration)

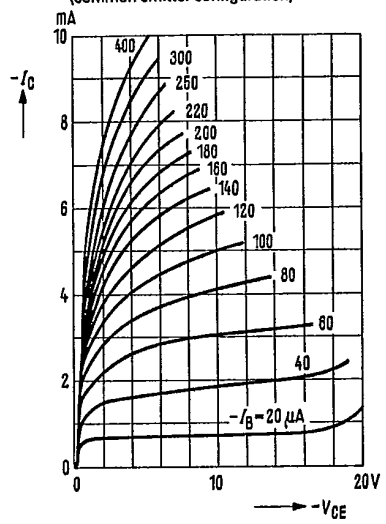


Collector current $I_C = f(V_{BE})$
V_{CE} = parameter
(common emitter configuration)

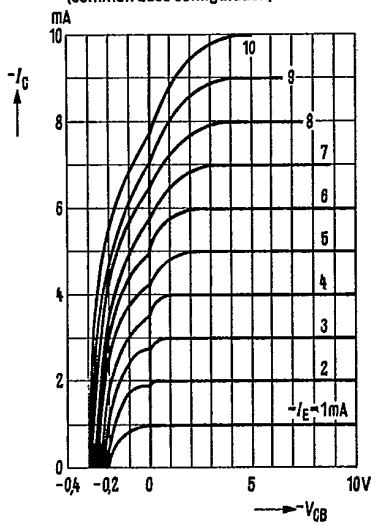


T-31-07

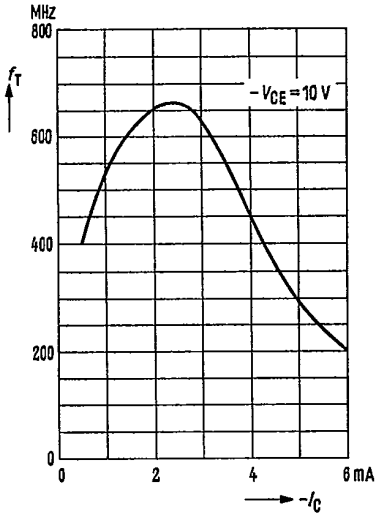
Output characteristics $I_C = f(V_{CE})$;
I_B = parameter
(common emitter configuration)



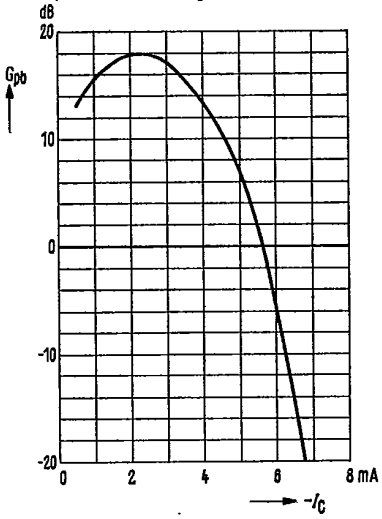
Output characteristics $I_C = f(V_{CB})$;
I_E = parameter
(common base configuration)



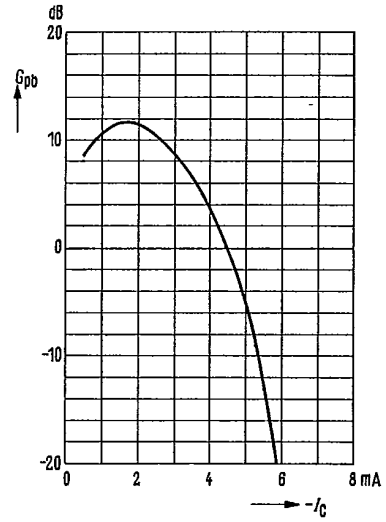
Transition frequency $f_T = f(I_C)$;
$-V_{CE}$ = 10 V; f = 100 MHz



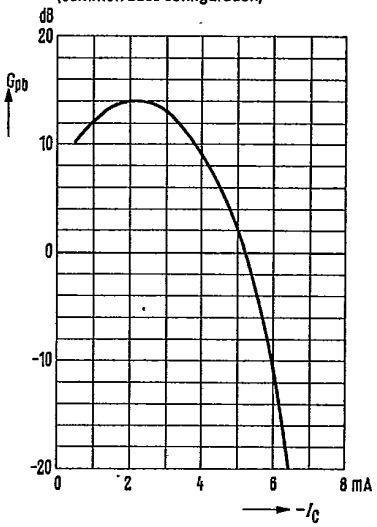
Power gain $G_{pb} = f(I_C)$
f = 500 MHz; $-V_{batt}$ = 10 V;
R_V = 1 kΩ; R_L = 2 kΩ
(common base configuration)



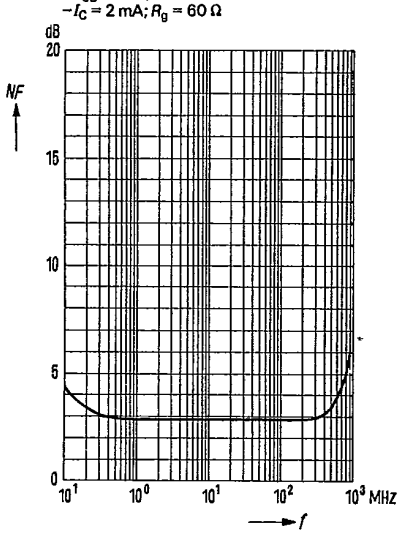
Power gain $G_{pb} = f(I_C)$
$f = 800$ MHz; $-V_{batt} = 10$ V; $R_V = 1$ kΩ;
$R_L = 500$ Ω
(common base configuration)



Power gain $G_{pb} = f(I_C)$
$f = 800$ MHz; $-V_{batt} = 10$ V
$R_V = 1$ kΩ; $R_L = 2$ kΩ
(common base configuration)

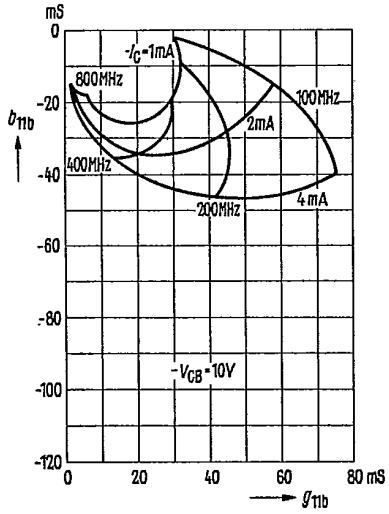


Noise figure versus frequency $NF = f(f)$
$-V_{CB} = 10$ V;
$-I_C = 2$ mA; $R_g = 60$ Ω

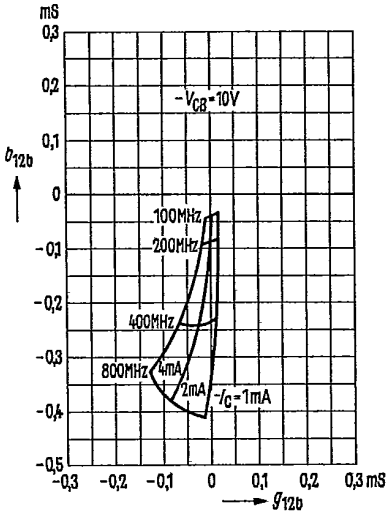


T-31-07

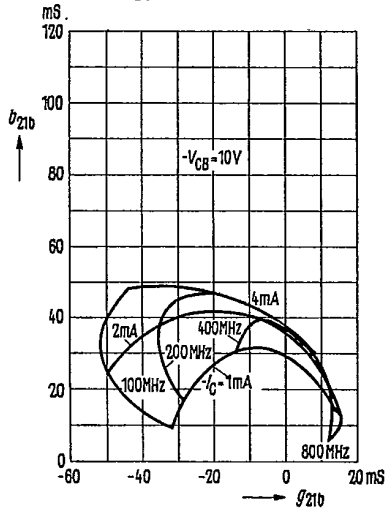
Small signal short circuit input admittance y_{11b}; $-V_{CB}$ = 10 V
(common base configuration)
measuring plane 5 mm below case bottom



Small signal circuit reverse transfer admittance y_{12b}; $-V_{CB}$ = 10 V
(common base configuration)
measuring plane 5 mm below case bottom



Small signal short circuit forward transfer admittance y_{21b}; $-V_{CB}$ = 10 V
(common base configuration)
measuring plane 5 mm below case bottom



Small signal short circuit output admittance Y_{22b}; $-V_{CB}$ = 10 V
(common base configuration)
measuring plane 5 mm below case bottom