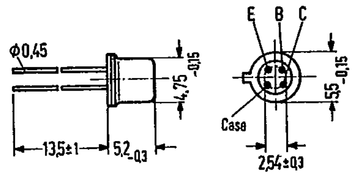
PNP Germanium RF Transistor

AF 106

for input, mixer, and oscillator stages up to 260 MHz

The AF 106 is a general-purpose germanium PNP high frequency mesa transistor in TO 72 case (18 A 4 DIN 41 876). The leads are electrically insulated from the case.

Type	Ordering code
AF 106	Q60106-X106



Approx. weight 0.4 g Dimensions in mm

Maximum ratings

Collector-emitter voltage	$-V_{CEO}$	18	V
Collector-base voltage	$-V_{CBO}$	25	V
Emitter-base voltage	$-V_{EBO}$	0.3	V
Collector current	$-I_C$	10	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)

$-V_{CE}$ V	I_C mA	$-I_B$ µA	h_{FE} I_C/I_B	$-V_{BE}$ V
12	1	20 (<40)	50 (>25)	0.325 (0.25 to 0.38)
6	2	29	70	0.34 (0.28 to 0.4)

Collector cutoff current ($-V_{CBO}$ = 12 V)	$-I_{CBO}$	0.5 (<10)	µA
Collector-base breakdown voltage ($-I_{CBO}$ = 100 µA)	$-V_{(BR)CBO}$	>25	V
Collector-emitter breakdown voltage ($-I_{CEO}$ = 500 µA)	$-V_{(BR)CEO}$	>18	V
Emitter-base breakdown voltage ($-I_{EBO}$ = 100 µA)	$-V_{(BR)EBO}$	>0.3	V

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

Operating point: $-I_C$ = 1 mA; $-V_{CB}$ or $-V_{CE}$ = 12 V			
Transition frequency (f = 100 MHz)	f_T	220	MHz
Max. frequency of oscillation $\left(f_{max} = \sqrt{\frac{f_T}{8 \cdot \pi \cdot r_{bb'} \cdot C_{b'c}}}\right)$	f_{max}	1.2	GHz
Small signal current gain (f = 1 kHz)	h_{fe}	65 (>30)	–
Noise figure (f = 200 MHz; R_g = 60 Ω)	NF	5.5 (<7.5)	dB
Reverse transfer capacitance (f = 450 kHz)	$-C_{12e}$	0.45	pF
Feedback time constant (f = 2.5 MHz)	$r_{bb'} \cdot C_{b'c}$	6	psec
Operating point: $-I_C$ = 3 mA; $-V_{CB}$ = 10 V f = 200 MHz; R_L = 920 Ω Power gain (measured in circuit shown below)	G_{pb}	17.5 (>14)	dB

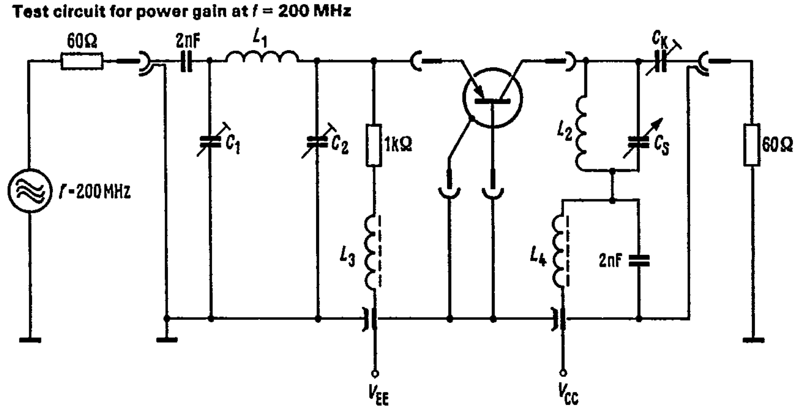
Four-pole characteristics:
$-I_C$ = 1 mA; $-V_{CB}$ = 12 V; f = 200 MHz

g_{11b} = 31 mS	g_{12b} = 0 mS	$\lvert y_{21b} \rvert$ = 27 mS	g_{22} = 0,15 mS
b_{11b} = –12 mS	b_{12b} = – 0,5 mS	φ_{21b} = 115 °	b_{22} = 1,9 mS
c_{11b} = – 9,5 pF	c_{12b} = – 0,4 pF		c_{22} = 1,5 pF

$-I_c$ = 1 mA; $-V_{CE}$ = 6 V; f = 100 MHz

g_{11b} = 36 mS	g_{12b} = 0,04 mS	g_{21b} = –27 mS	g_{22} = 0,09 mS
b_{11b} = –6 mS	b_{12b} = –0,48 mS	b_{21b} = 20 mS	b_{22} = 1 mS

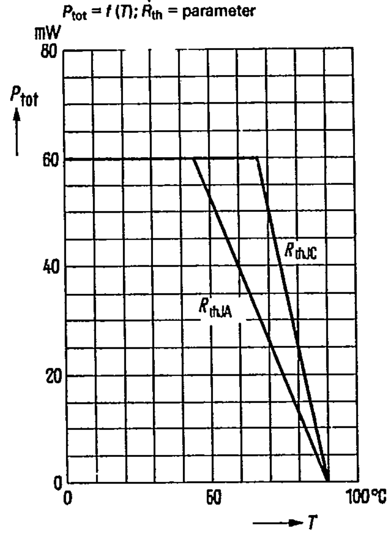
Test circuit for power gain at f = 200 MHz



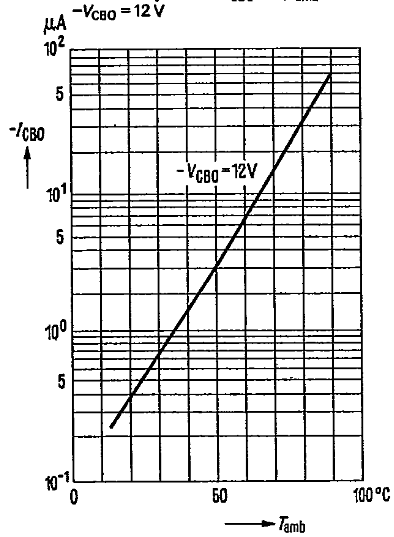
L_1 = 3 turns; d = 1 mm; D = 6.5 mm
L_2 = 2 turns; d = 1 mm; D = 6.5 mm
L_3 = L_4 = 20 turns 0.5 CuLs
on core B63310-K1-A12.3

C_K = 1.5 to 5 pF so that R_L = 920 Ω
C_1 = 6.5 to 18 pF
C_2 = 9.5 to 20 pF
C_s = 3 to 10 pF

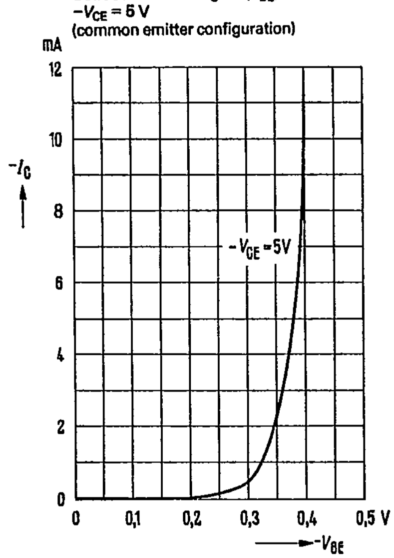
Total perm. power dissipation versus temperature
$P_{tot} = f(T)$; R_{th} = parameter



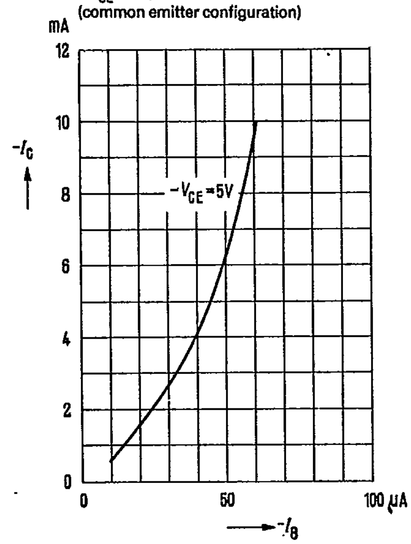
Collector cutoff current versus temperature $I_{CBO} = f(T_{amb})$
$-V_{CBO} = 12$ V



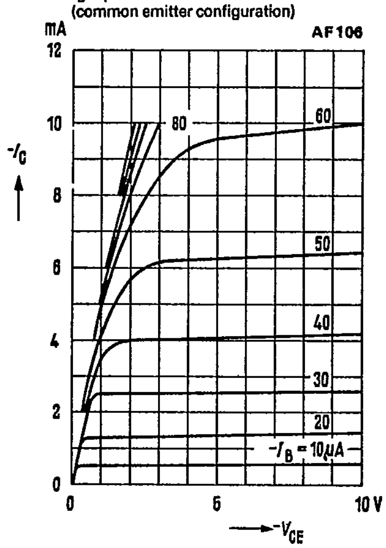
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 5$ V
(common emitter configuration)



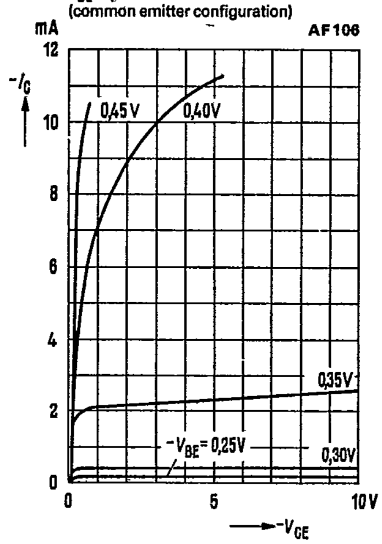
Collector current $I_C = f(I_B)$
$-V_{CE} = 5$ V
(common emitter configuration)



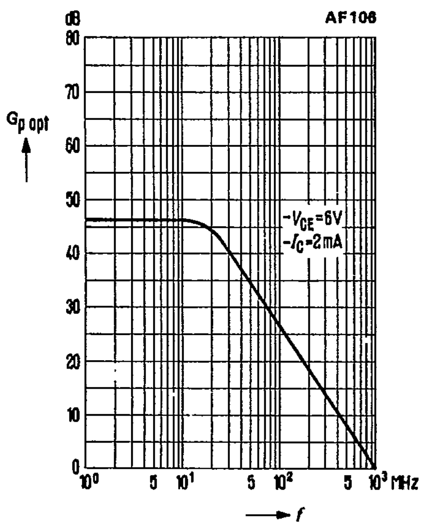
Output characteristics $I_C = f(V_{CE})$;
I_B = parameter
(common emitter configuration)



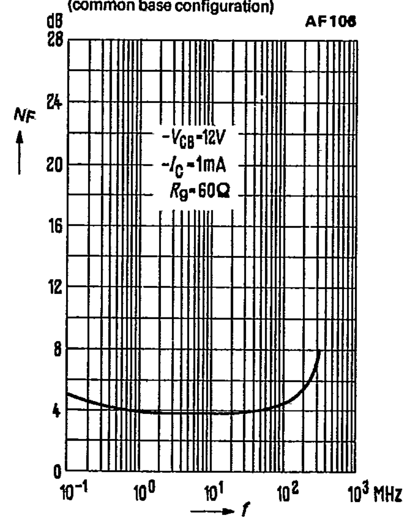
Output characteristics $I_C = f(V_{CE})$;
V_{BE} = parameter
(common emitter configuration)



Optimum power gain $G_{p\,opt} = f(f)$
$-V_{CE} = 6$ V; $-I_C = 2$ mA
(common emitter configuration)



Noise figure versus frequency
$NF = f(f)$; $-V_{CB} = 12$ V; $-I_C = 1$ mA;
$R_g = 60\ \Omega$
(common base configuration)



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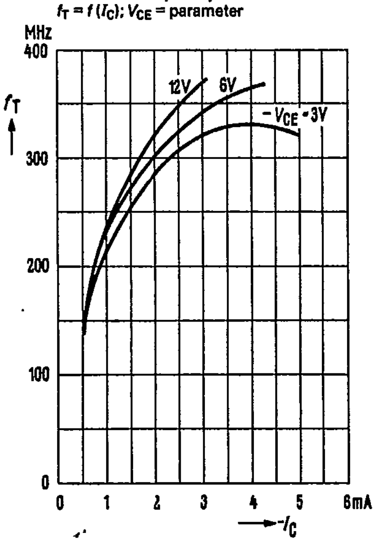
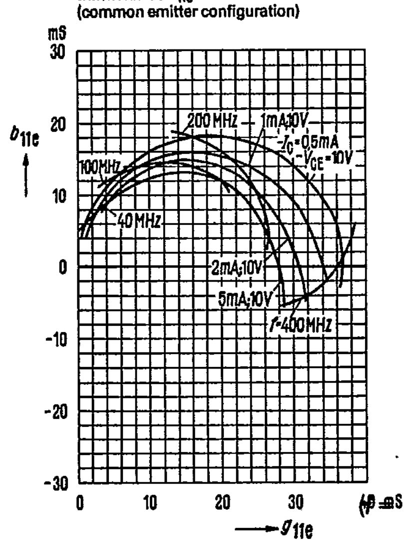
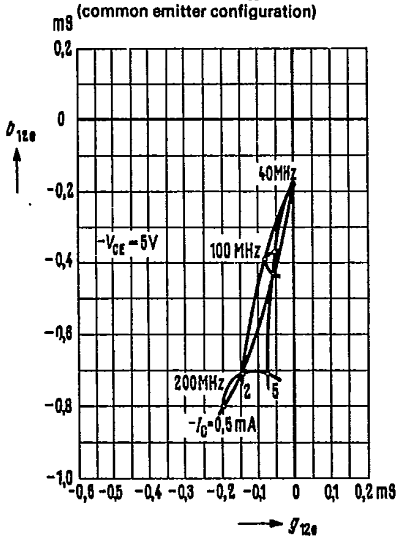
Transition frequency
$f_T = f(I_C)$; V_{CE} = parameter



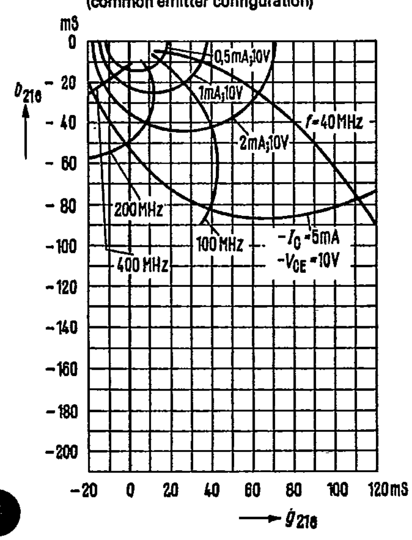
Small signal short circuit input admittance Y_{11e}
(common emitter configuration)



Small signal short circuit reverse transfer admittance Y_{12e}
(common emitter configuration)



Small signal short circuit forward transfer admittance Y_{21e}
(common emitter configuration)



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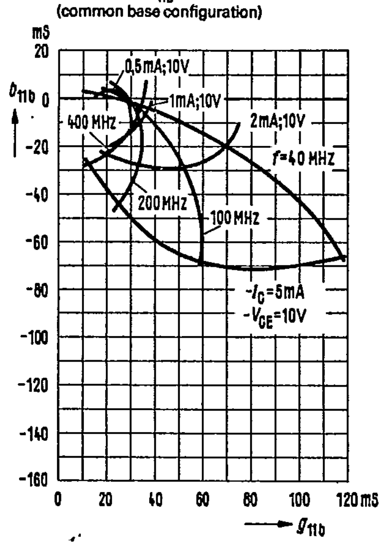
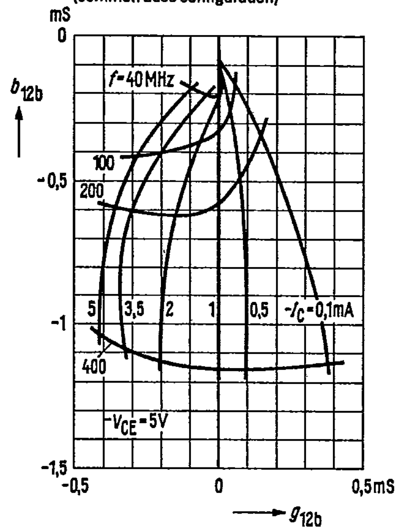
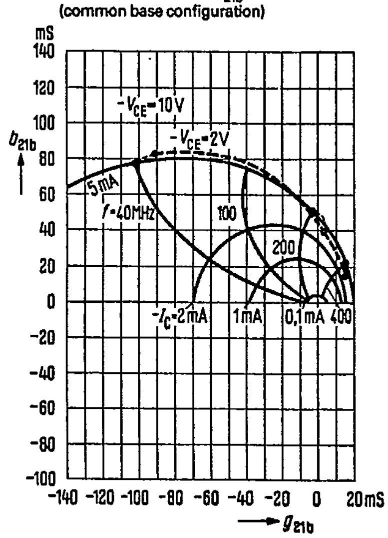
Small signal short circuit input admittance Y_{11b} (common base configuration)



Small signal short circuit reverse transfer admittance Y_{12b} (common base configuration)



Small signal short circuit forward transfer admittance Y_{21b} (common base configuration)



Small signal short circuit output admittance Y_{22b} (common emitter and base configuration)