

25C D ■ 8235605 0004047 5 ■ SIEG
PNP Germanium RF Transistor

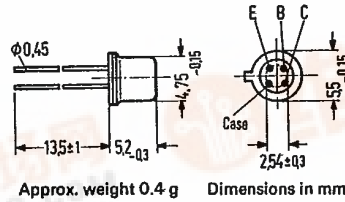
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AF106

SIEMENS AKTIENGESELLSCHAFT 25C 04047 D

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



Maximum ratings

Collector-emitter voltage	$-V_{CE0}$	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 ($T_{amb} = 45\text{°C}$)	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 ($T_{amb} = 25\text{°C}$)

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



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Dynamic characteristics ($T_{amb} = 25^\circ\text{C}$)

Operating point: $-I_C = 1 \text{ mA}$; $-V_{CB}$ or $-V_{CE} = 12 \text{ V}$

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

Four-pole characteristics:

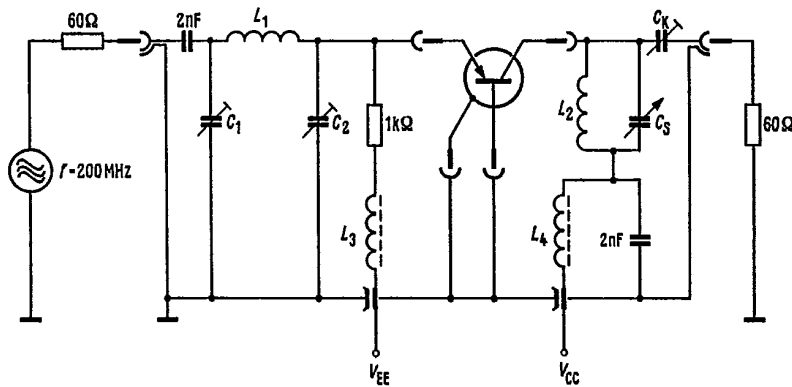
$-I_C = 1 \text{ mA}$; $-V_{CB} = 12 \text{ V}$; $f = 200 \text{ MHz}$

$g_{11b} = 31 \text{ mS}$	$g_{12b} = 0 \text{ mS}$	$ y_{21b} = 27 \text{ mS}$	$g_{22} = 0,15 \text{ mS}$
$b_{11b} = -12 \text{ mS}$	$b_{12b} = -0,5 \text{ mS}$	$\varphi_{21b} = 115^\circ$	$b_{22} = 1,9 \text{ mS}$
$c_{11b} = -9,5 \text{ pF}$	$c_{12b} = -0,4 \text{ pF}$		$c_{22} = 1,5 \text{ pF}$

$-I_C = 1 \text{ mA}$; $-V_{CE} = 6 \text{ V}$; $f = 100 \text{ MHz}$

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

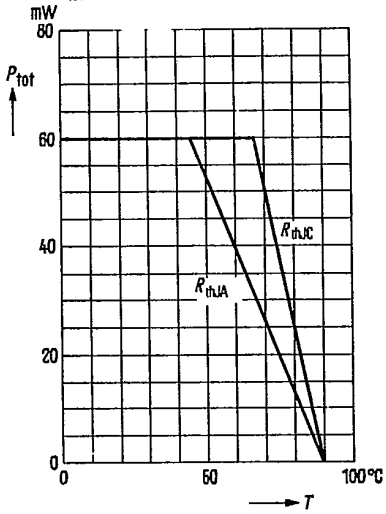
Test circuit for power gain at $f = 200 \text{ MHz}$



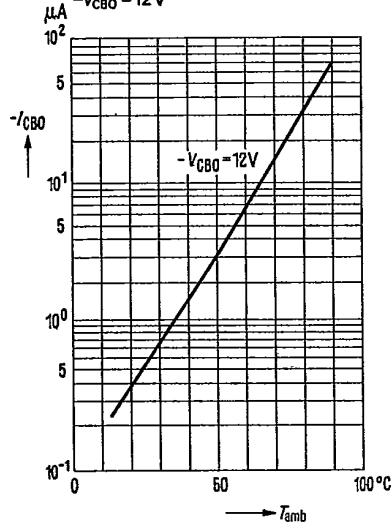
- $L_1 = 3 \text{ turns}$; $d = 1 \text{ mm}$; $D = 6.5 \text{ mm}$
- $L_2 = 2 \text{ turns}$; $d = 1 \text{ mm}$; $D = 6.5 \text{ mm}$
- $L_3 = L_4 = 20 \text{ turns}$ 0.5 CuLs on core B63310-K1-A12.3
- $C_K = 1.5 \text{ to } 5 \text{ pF}$ so that $R_L = 920 \Omega$
- $C_1 = 6.5 \text{ to } 18 \text{ pF}$
- $C_2 = 9.5 \text{ to } 20 \text{ pF}$
- $C_3 = 3 \text{ to } 10 \text{ pF}$

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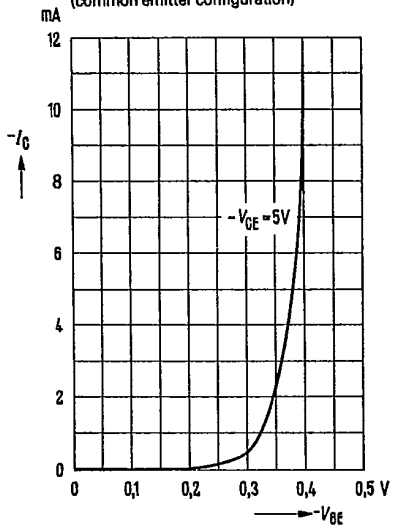
Total perm. power dissipation versus temperature
 $P_{tot} = f(T); R_{th} = \text{parameter}$



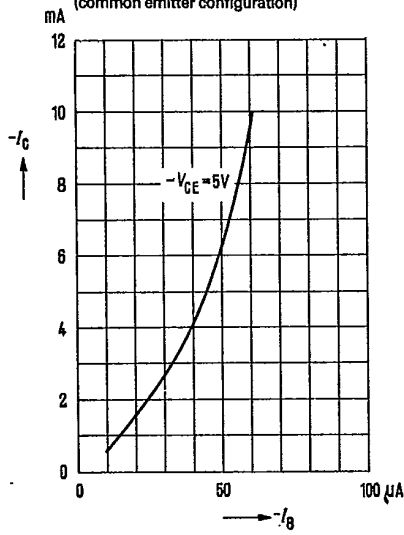
Collector cutoff current versus temperature $I_{CBO} = f(T_{amb})$
 $-V_{CBO} = 12\text{ V}$



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

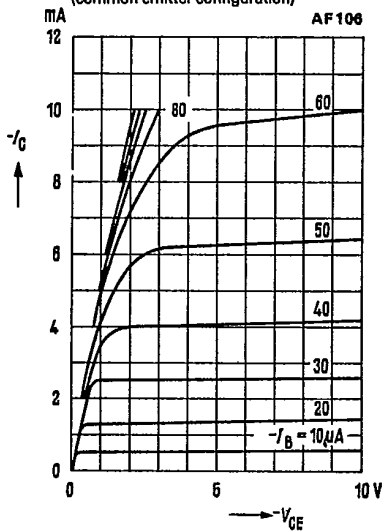


Collector current $I_C = f(I_B)$
 $-V_{CE} = 5\text{ V}$
 (common emitter configuration)

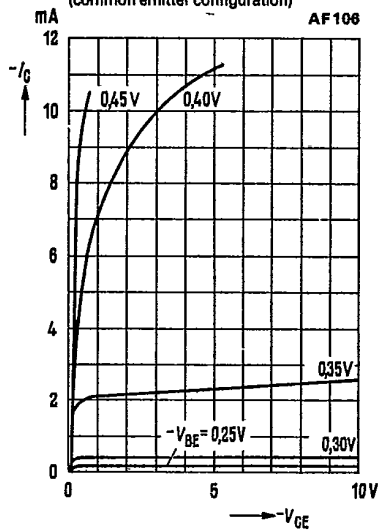


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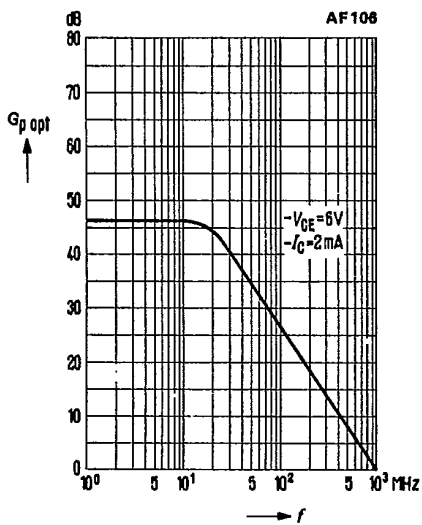
Output characteristics $I_C = f(V_{CE})$;
 $I_B = \text{parameter}$
 (common emitter configuration)



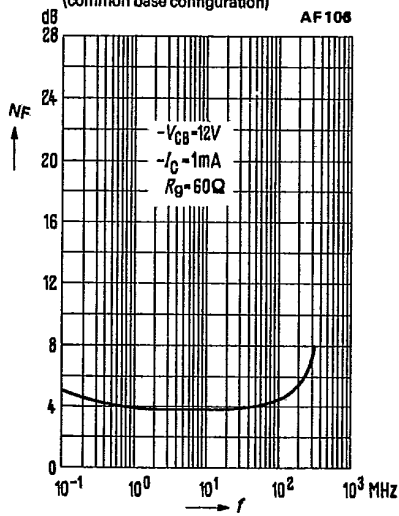
Output characteristics $I_C = f(V_{CE})$;
 $V_{BE} = \text{parameter}$
 (common emitter configuration)



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

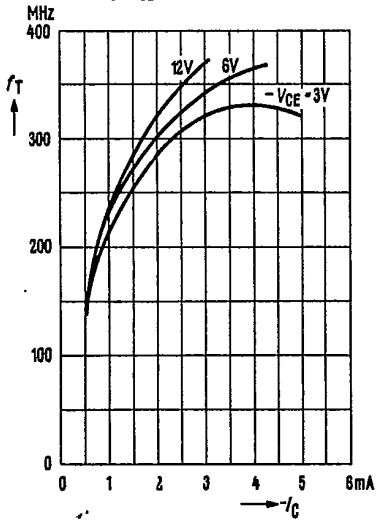


Noise figure versus frequency
 $NF = f(f)$; $-V_{CB} = 12 \text{ V}$; $-I_C = 1 \text{ mA}$;
 $R_G = 60 \Omega$
 (common base configuration)

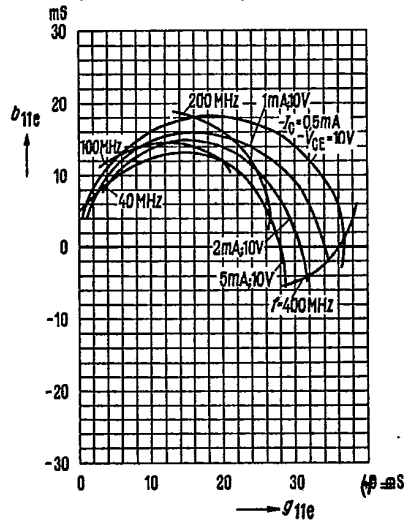


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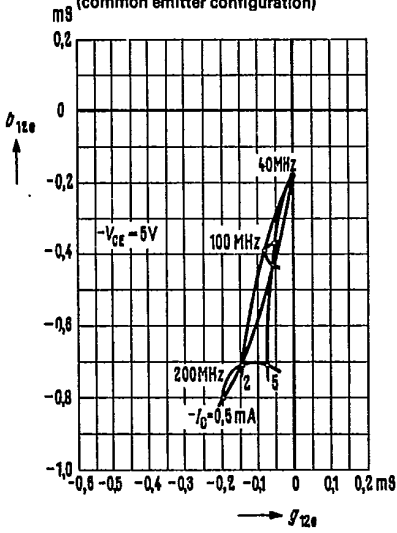
Transition frequency
 $f_T = f(f_C); V_{CE} = \text{parameter}$



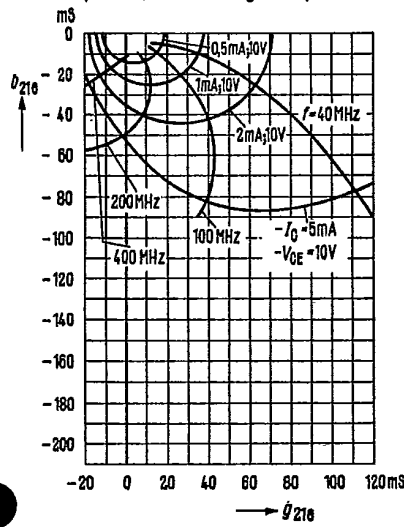
Small signal short circuit input admittance Y_{11e}
 (common emitter configuration)



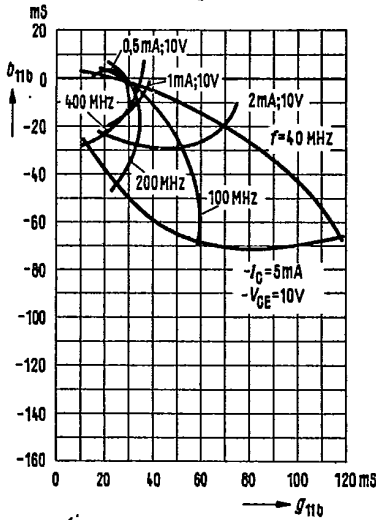
Small signal short circuit reverse transfer admittance Y_{12e}
 (common emitter configuration)



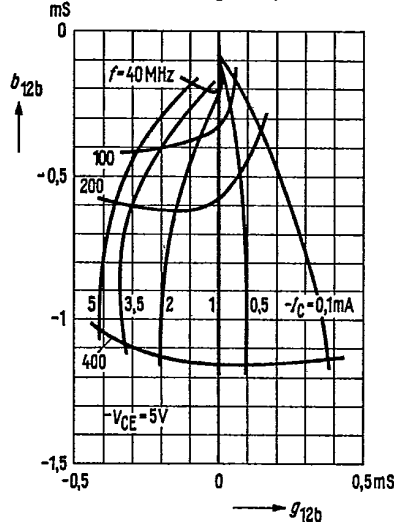
Small signal short circuit forward transfer admittance Y_{21e}
 (common emitter configuration)



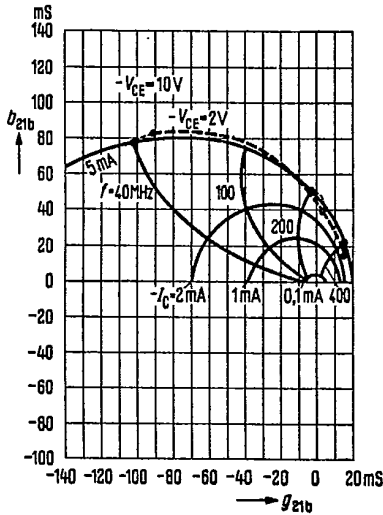
Small signal short circuit input admittance Y_{11b} (common base configuration)



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)

