

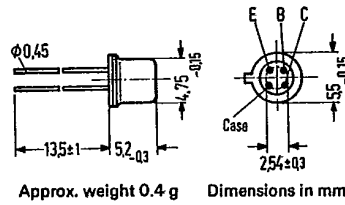
25C D ■ 8235605 0004047 5 ■ SIEG T-31-07  
 PNP Germanium RF Transistor AF106

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	$-V_{CEO}$	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 ( $T_{amb} = 45^\circ\text{C}$ )	$P_{tot}$	60	mW

**Thermal resistance**

Junction to ambient air	$R_{thJA}$	$\leq 750$	K/W
Junction to case	$R_{thJC}$	$\leq 400$	K/W

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

$-V_{CE}$ V	$I_C$ mA	$-I_B$ $\mu\text{A}$	$h_{FE}$ $I_C/I_B$	$-V_{BE}$ 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)	$\mu\text{A}$
Collector-base breakdown voltage ( $-I_{CBO} = 100\ \mu\text{A}$ )	$-V_{(BR)CBO}$	>25	V
Collector-emitter breakdown voltage ( $-I_{CEO} = 500\ \mu\text{A}$ )	$-V_{(BR)CEO}$	>18	V
Emitter-base breakdown voltage ( $-I_{EBO} = 100\ \mu\text{A}$ )	$-V_{(BR)EBO}$	>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 ( $f_{max} = \sqrt{\frac{f_T}{8 \cdot \pi \cdot f_{bb'} \cdot C_{b'c}}}$ )	$f_{max}$	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 ( $f = 450\text{ kHz}$ )	$-C_{12e}$	0.45	pF
Feedback time constant ( $f = 2.5\text{ MHz}$ )	$f_{bb'} \cdot C_{b'c}$	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:**

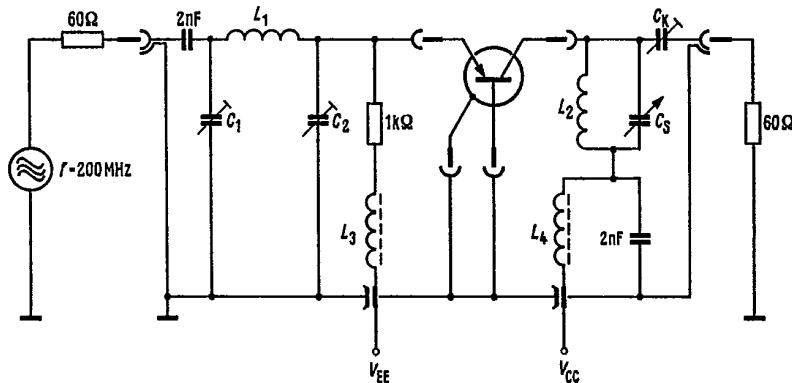
$-I_C = 1\text{ mA}$ ;  $-V_{CB} = 12\text{ V}$ ;  $f = 200\text{ MHz}$

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

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

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

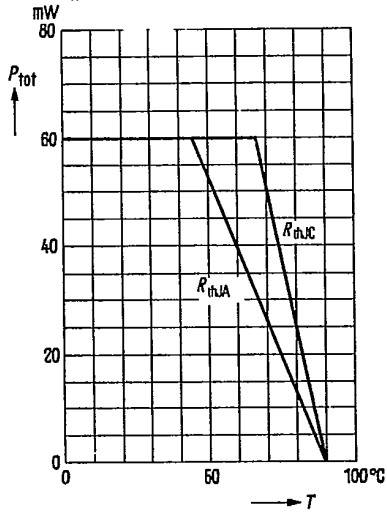
**Test circuit for power gain at  $f = 200\text{ MHz}$**



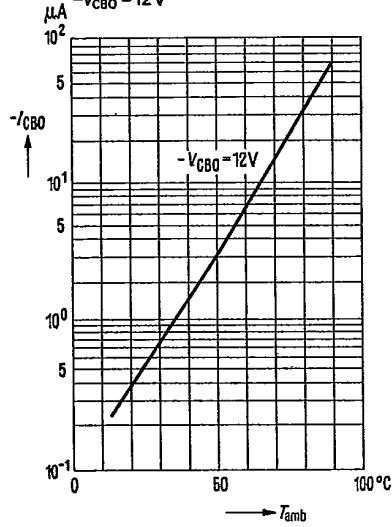
- $L_1 = 3\text{ turns}$ ;  $d = 1\text{ mm}$ ;  $D = 6.5\text{ mm}$
- $L_2 = 2\text{ turns}$ ;  $d = 1\text{ mm}$ ;  $D = 6.5\text{ mm}$
- $L_3 = L_4 = 20\text{ turns}$  0.5 CuLs
- on core B63310-K1-A12.3
- $C_K = 1.5\text{ to }5\text{ pF}$  so that  $R_L = 920\ \Omega$
- $C_1 = 6.5\text{ to }18\text{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

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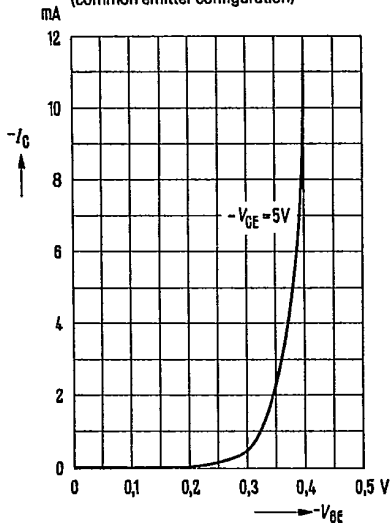
Total perm. power dissipation versus temperature  
 $P_{tot} = f(T); R_{th} = \text{parameter}$



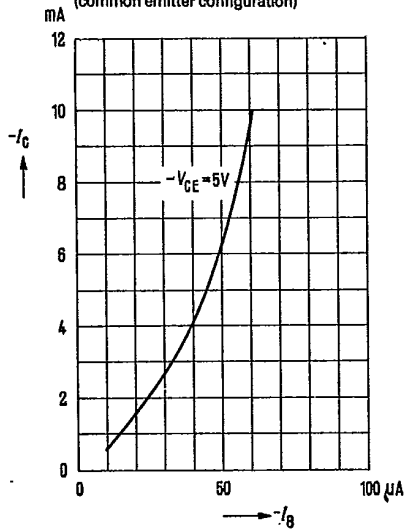
Collector cutoff current versus temperature  $I_{CBO} = f(T_{amb})$   
 $-V_{CBO} = 12V$



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

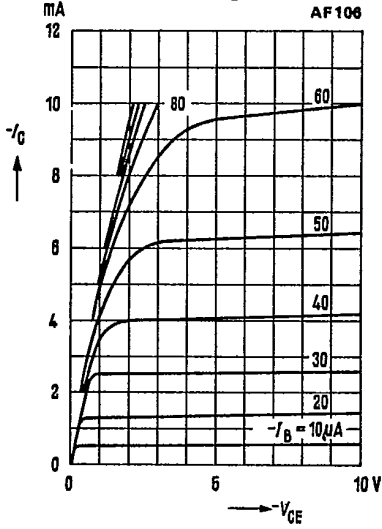


Collector current  $I_C = f(I_B)$   
 $-V_{CE} = 5V$   
 (common emitter configuration)

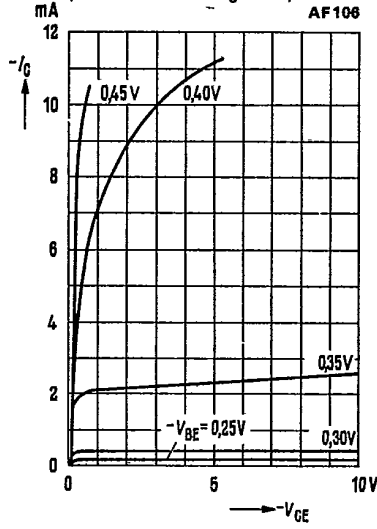


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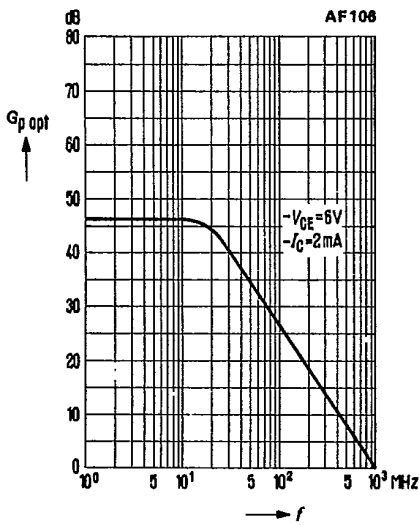
Output characteristics  $I_C = f(V_{CE})$ ;  
 $I_B$  = parameter  
 (common emitter configuration)



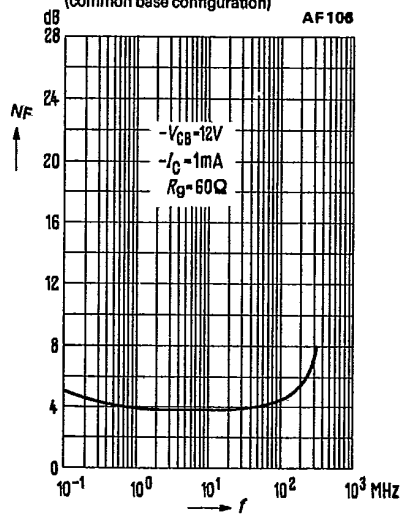
Output characteristics  $I_C = f(V_{CE})$ ;  
 $V_{BE}$  = parameter  
 (common emitter configuration)



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

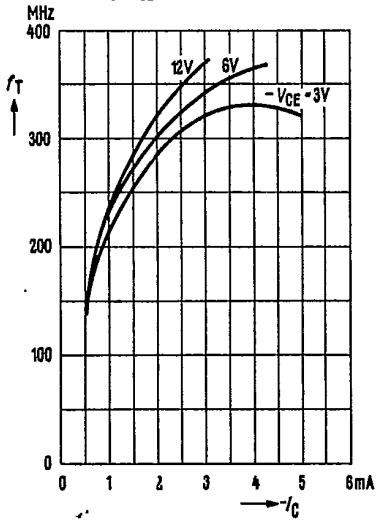


Noise figure versus frequency  
 $NF = f(f)$ ;  $-V_{CB} = 12\text{V}$ ;  $-I_C = 1\text{mA}$ ;  
 $R_G = 60\Omega$   
 (common base configuration)

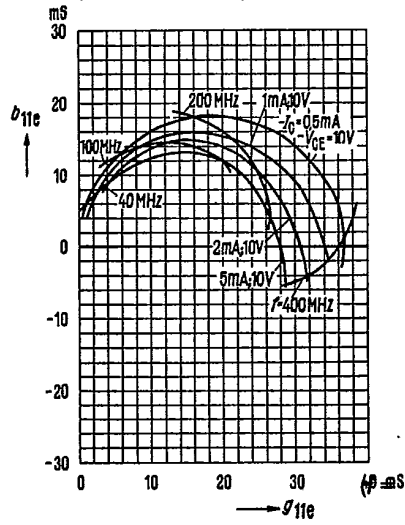


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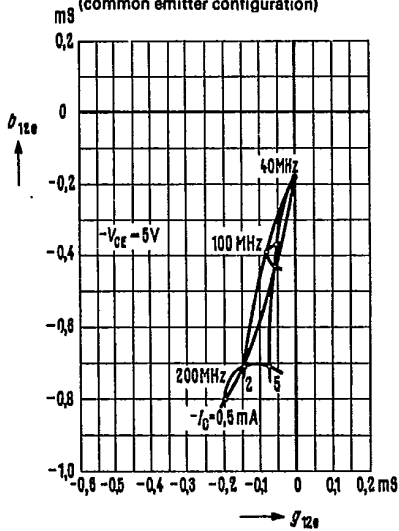
Transition frequency  
 $f_T = f(f_C)$ ;  $V_{CE} = \text{parameter}$



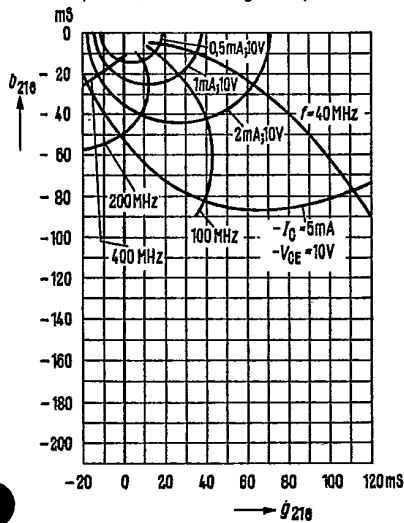
Small signal short circuit input admittance  $Y_{11e}$   
 (common emitter configuration)



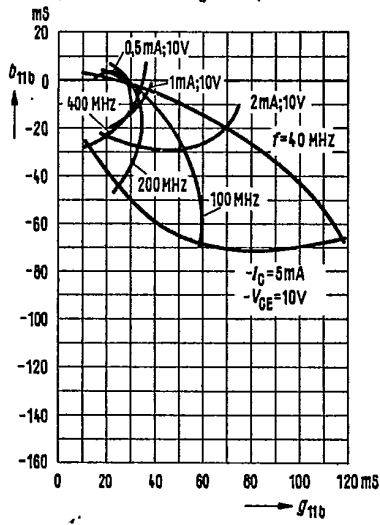
Small signal short circuit reverse transfer admittance  $Y_{12e}$   
 (common emitter configuration)



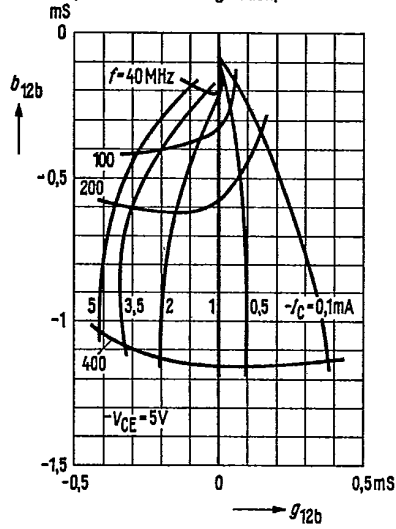
Small signal short circuit forward transfer admittance  $Y_{21e}$   
 (common emitter configuration)



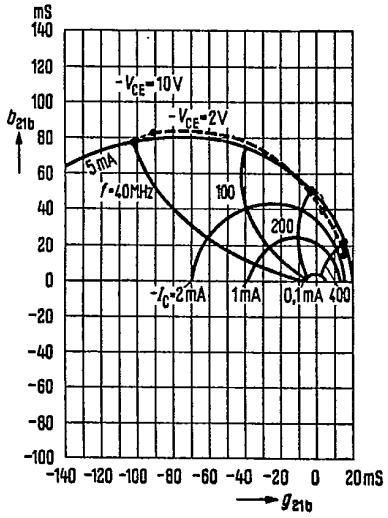
Small signal short circuit input admittance  $Y_{11b}$  (common base configuration)



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)

