

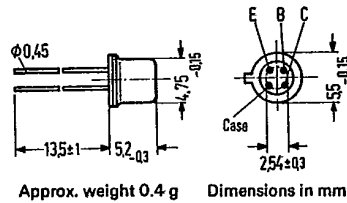
25C D ■ 8235605 0004047 5 ■ SIEG T-31-07
PNP Germanium RF Transistor AF 106

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 ($T_{amb} = 45^\circ\text{C}$)	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 ($T_{amb} = 25^\circ\text{C}$)

$-V_{CE}$ 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 ($-I_{CBO} = 100\text{ }\mu\text{A}$)	$-V_{(BR)CBO}$	>25	V
Collector-emitter breakdown voltage ($-I_{CEO} = 500\text{ }\mu\text{A}$)	$-V_{(BR)CEO}$	>18	V
Emitter-base breakdown voltage ($-I_{EBO} = 100\text{ }\mu\text{A}$)	$-V_{(BR)EBO}$	>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 ($f = 100\text{ MHz}$)

$$\text{Max. frequency of oscillation } \left(f_{\max} = \sqrt{\frac{f_T}{8 \cdot \pi \cdot r_{bb'} \cdot C_{b'c}}} \right) f_{\max}$$

Small signal current gain ($f = 1\text{ kHz}$)Noise figure ($f = 200\text{ MHz}$; $R_g = 60\ \Omega$)Reverse transfer capacitance ($f = 450\text{ kHz}$)Feedback time constant ($f = 2.5\text{ MHz}$)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)

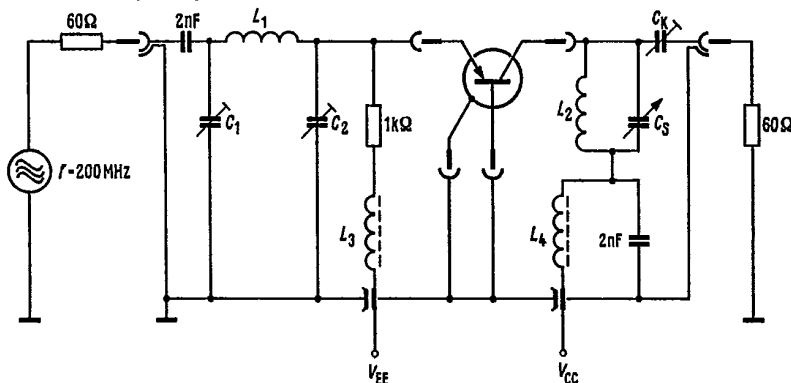
f_T	220	MHz
$f_{\max}$	1.2	GHz
h_{fe}	65 (>30)	—
NF	5.5 (<7.5)	dB
$-C_{12e}$	0.45	pF
$r_{bb'} \cdot C_{b'c}$	6	psec
G_{pb}	17.5 (>14)	dB

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

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

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

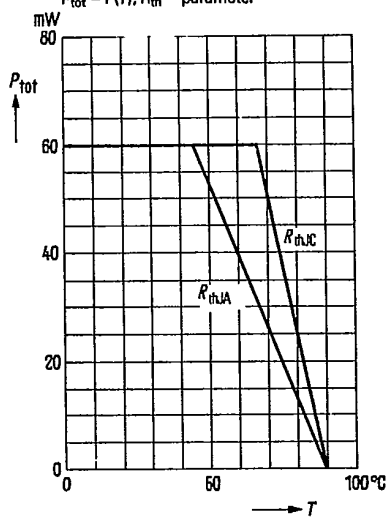
Test circuit for power gain at $f = 200\text{ MHz}$ 

$L_1 = 3\text{ turns; } d = 1\text{ mm; } D = 6.5\text{ mm}$
 $L_2 = 2\text{ turns; } d = 1\text{ mm; } D = 6.5\text{ mm}$
 $L_3 = L_4 = 20\text{ turns } 0.5\text{ CuLs}$
 on core B63310-K1-A12:3

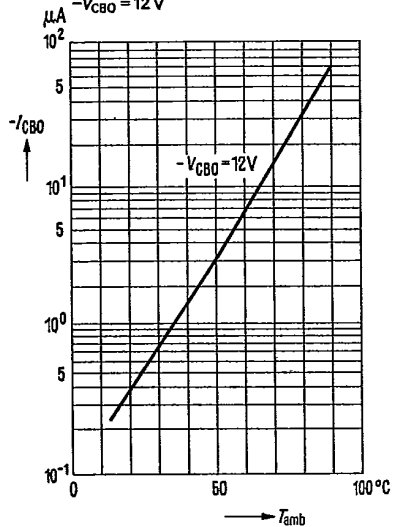
$C_K = 1.5\text{ to }5\text{ pF so that } R_L = 920\ \Omega$
 $C_1 = 6.5\text{ to }18\text{ pF}$
 $C_2 = 9.5\text{ to }20\text{ pF}$
 $C_3 = 3\text{ to }10\text{ pF}$

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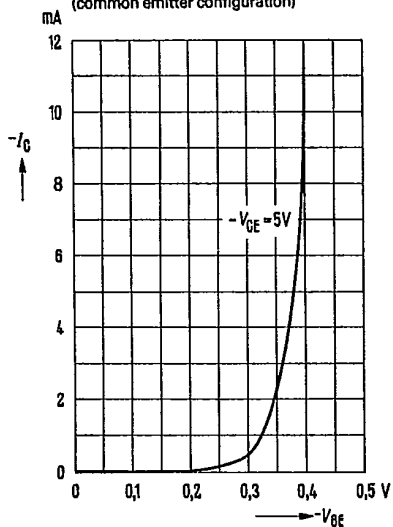
Total perm. power dissipation
versus temperature
 $P_{\text{tot}} = f(T)$; R_{th} = parameter



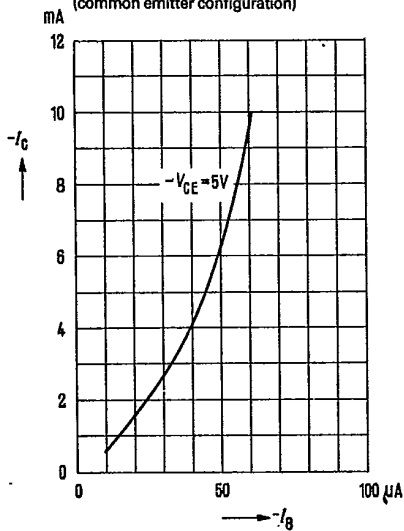
Collector cutoff current
versus temperature $I_{\text{CBO}} = f(T_{\text{amb}})$
 $-V_{\text{CBO}} = 12 \text{ V}$



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

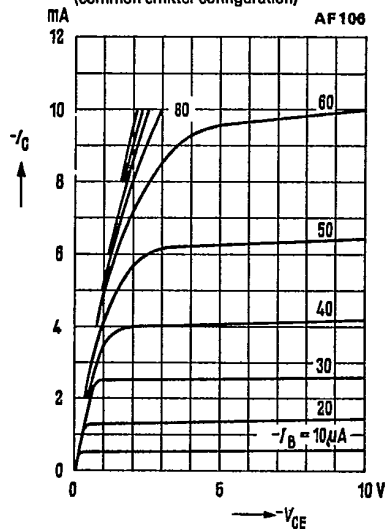


Collector current $I_{\text{C}} = f(I_{\text{B}})$
 $-V_{\text{CE}} = 5 \text{ V}$
(common emitter configuration)

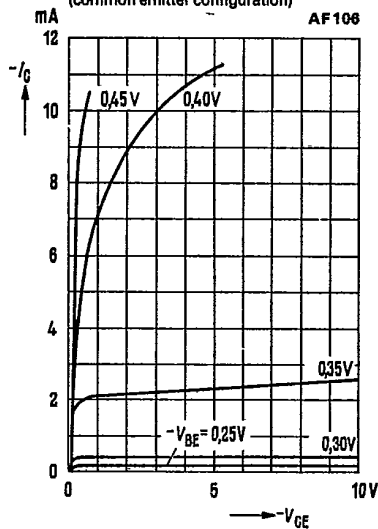


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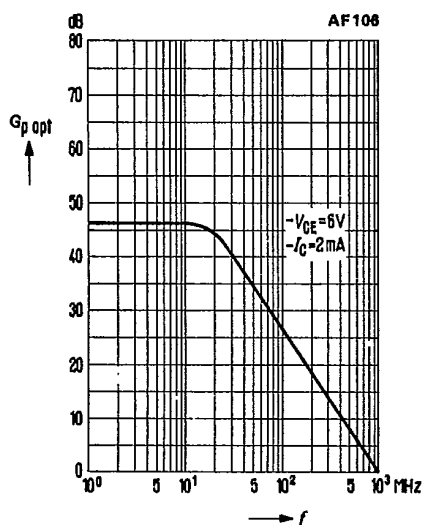
Output characteristics $I_C = f(V_{CE})$;
 I_B = parameter
(common emitter configuration)



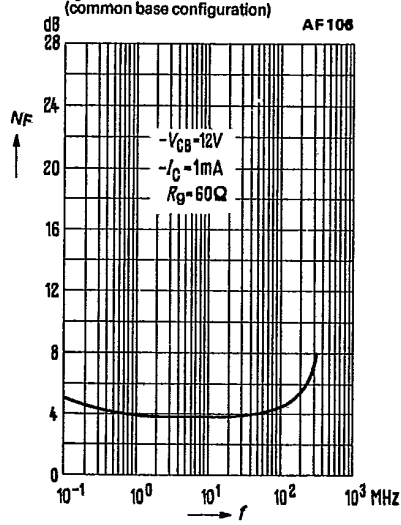
Output characteristics $I_C = f(V_{CE})$;
 V_{BE} = parameter
(common emitter configuration)



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

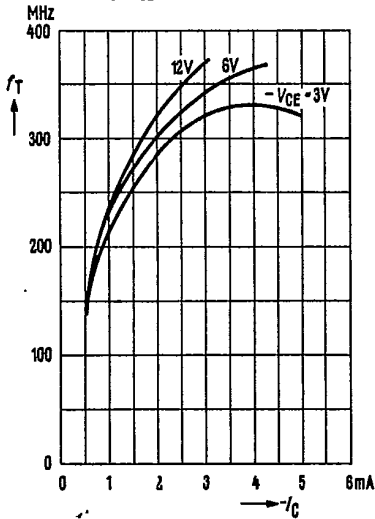


Noise figure versus frequency
 $NF = f(f)$; $-V_{CB} = 12\text{ V}$; $-I_C = 1\text{ mA}$;
 $R_G = 60\ \Omega$
(common base configuration)

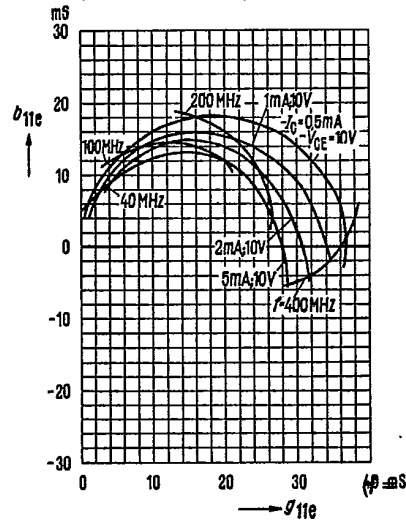


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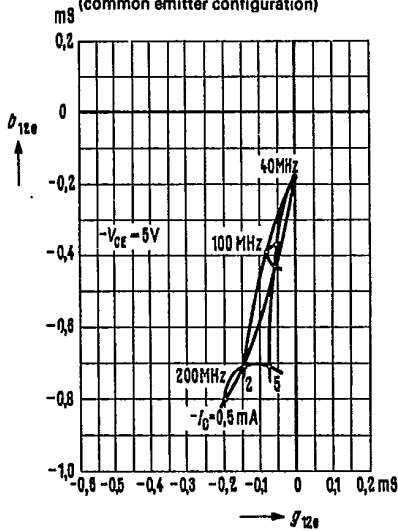
Transition frequency
 $f_T = f(f_C)$; V_{CE} = parameter



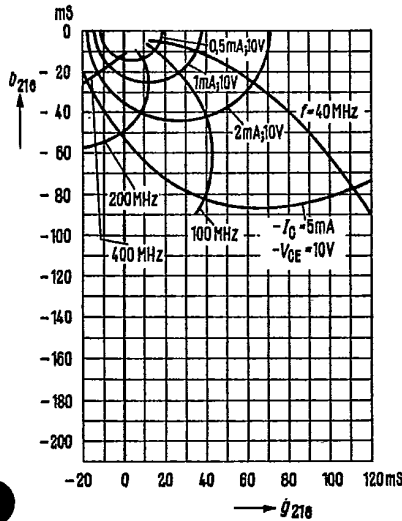
Small signal short circuit input
admittance Y_{i1e}
(common emitter configuration)



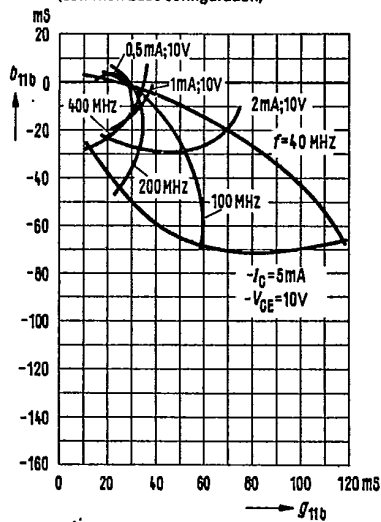
Small signal short circuit reverse
transfer admittance Y_{12e}
(common emitter configuration)



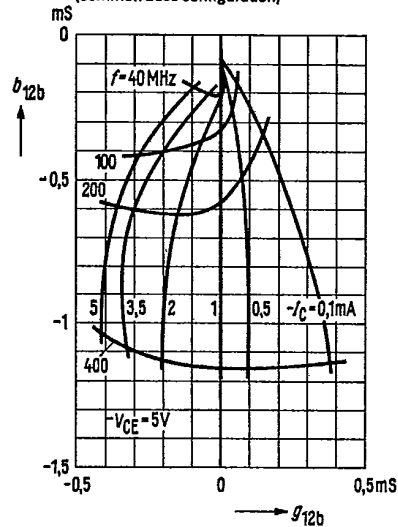
Small signal short circuit forward
transfer admittance Y_{21e}
(common emitter configuration)



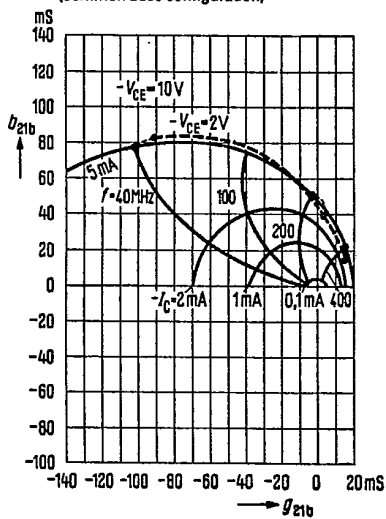
Small signal short circuit input
admittance Y_{11b}
(common base configuration)



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)

