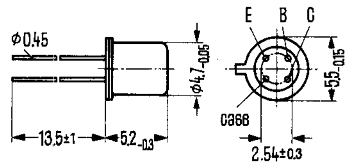
PNP Mesa transistor for RF-application up to 260 MHz

The AFY 12 is a germanium PNP RF mesa transistor for general high-frequency use in a case 18 A 4 DIN 41 876 (TO-72). The terminals are electrically insulated from the case. The AFY 12 is designed for use in pre-stages, mixer stages and oscillator stages up to 260 MHz.

Type	Order number
AFY 12	Q60106–Y12



Weight approx. 0.4 g Dimensions in mm

Maximum ratings		AFY 12	
Collector-emitter voltage	$-V_{CEO}$	18	V
Collector-base voltage	$-V_{CBO}$	25	V
Emitter-base voltage	$-V_{EBO}$	0.5	V
Collector current	$-I_C$	10	mA
Junction temperature	T_j	90	°C
Storage temperature	T_s	−30 to +75	°C
Total power dissipation ($T_{case} \leqq 45$ °C)	P_{tot}	112	mW
Thermal resistance			
Junction to ambient air	R_{thJamb}	≦750	K/W
Junction to case	$R_{thJcase}$	≦400	K/W

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

For the conditions stated below, the following data apply:

$-V_{CE}$ V	$-I_C$ mA	$-I_B$ µA	h_{FE} I_C/I_B	$-V_{BE}$ V
12	1	20 (8.3 to 40)	50 (25 to 120) *	0.325 (0.25 to 0.38)
6	2	29	70	0.34 (0.28 to 0.4)

Collector-base-cutoff current ($-V_{CBO}=12$ V)	$-I_{CBO}$	0.4 (<3)	µA
Collector-base-cutoff current ($-V_{CBO}=25$ V)	$-I_{CBO}$	0.7 (<10) *	µA
Collector-base-cutoff current ($-V_{CBO}=25$ V; $T_{amb}=60$ °C)	$-I_{CBO}$	7 (<70)	µA
Emitter-base-cutoff current ($-V_{EBO}=0.3$ V)	$-I_{EBO}$	<10 *	µA
Collector-emitter breakdown voltage ($-I_{CEO}=500$ µA)	$-V_{(BR)CEO}$	>18	V
Emitter-base breakdown voltage ($-I_{EBO}=100$ µA)	$-V_{(BR)EBO}$	>0.5	V

* AQL = 0.65%

Dynamic characteristics ($T_{amb} = 25\ °C$)		AFY 12	
Test condition: $-I_C = 1$ mA; $-V_{CB}$ or $-V_{CE} = 12$ V			
Current gain-bandwidth product ($f = 100$ MHz)	f_T	230	MHz
Oscillation cutoff frequency $\left(f_{max} = \sqrt{\dfrac{f_T}{8 \cdot \pi \cdot r_{bb'} \cdot C_{b'c}}}\right)$	f_{max}	1.35	GHz
AC forward current transfer ratio ($f = 1$ kHz)	h_{fe}	65 (>30)	–
Noise figure ($f = 200$ MHz; $R_g = 60\ \Omega$)	NF	5 (<7)	db
Short circuit reverse capacitance ($f = 450$ kHz)	$-C_{12e}$	0.45	pf
Feedback time constant ($f = 2.5$ MHz)	$r_{bb'} \cdot C_{b'c}$	5	ps
Test condition: $-I_C = 3$ mA; $-V_{CB} = 10$ V; $f = 200$ MHz			
Power gain (measured in circuit stated below)	G_{pb}	17.5 (>16) *	db

Test condition: $-I_C = 1$ mA; $-V_{CB} = 12$ V; $f = 200$ MHz

$g_{11b} = 31$ mmhos	$g_{12b} = 0$ mmhos	$\|y_{21b}\| = 27$ mmhos	$g_{22} = 0.15$ mmhos
$b_{11b} = -12$ mmhos	$b_{12b} = -0.5$ mmhos	$\varphi_{21b} = 115°$	$b_{22} = 1.9$ mmhos
$C_{11b} = -9.5$ pf	$C_{12b} = -0.4$ pf		$C_{22} = 1.5$ pf

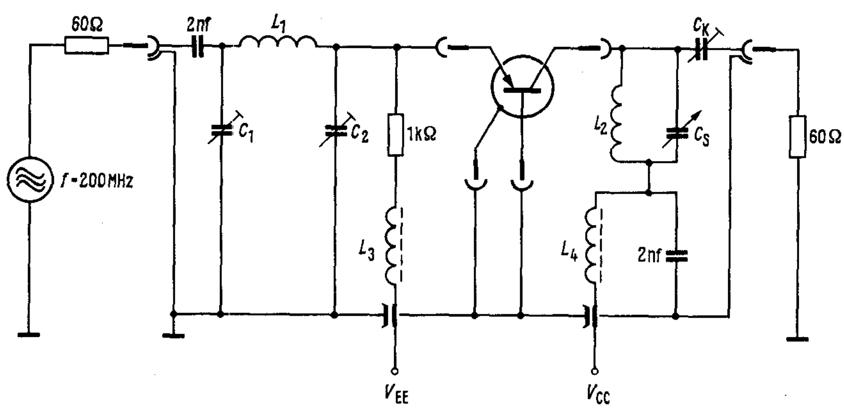
Test condition: $-I_C = 1$ mA; $-V_{CE} = 6$ V; $f = 100$ MHz

$g_{11b} = 36$ mmhos	$g_{12b} = -0.04$ mmhos	$g_{21b} = -27$ mmhos	$g_{22} = 0.09$ mmhos
$b_{11b} = -6$ mmhos	$b_{12b} = -0.48$ mmhos	$b_{21b} = 20$ mmhos	$b_{22} = 1$ mmhos

Test condition: $-I_C = 1$ mA; $-V_{CE} = 12$ V; $f = 35$ MHz

$g_{11e} = 1.5$ mmhos	$g_{12e} = 0$ mmhos	$\|y_{21e}\| = 36$ mmhos	$g_{22} = 0.01$ mmhos
$b_{11e} = 5$ mmhos	$b_{12e} = -0.12$ mmhos	$\varphi_{21e} = -12°$	$b_{22} = 0.31$ mmhos
$C_{11e} = 23$ pf	$C_{12e} = -0.55$ pf		$C_{22} = 1.4$ pf

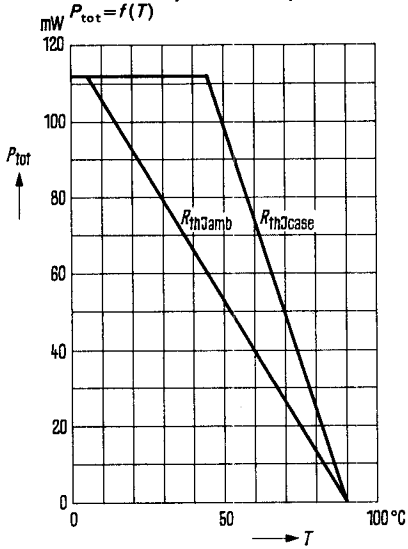
Power gain measuring circuit ($f = 200$ MHz)



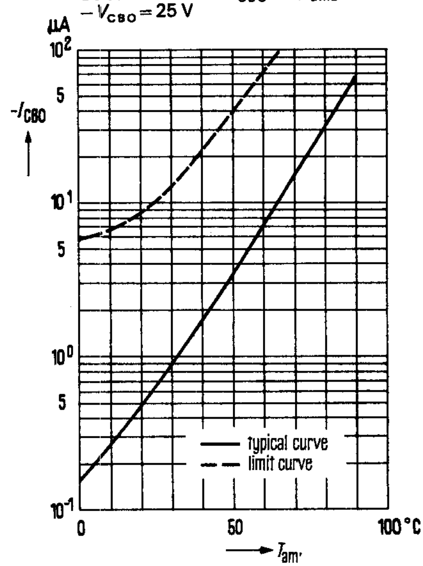
$L_1 = 3$ turns; d = 1 mm; dia = 6.5 mm. $L_2 = 2$ turns; d = 1 mm; dia = 6.5 mm.
$L_3 = L_4 = 20$ turns 0.5 enameled silk-covered copper wire on core B 63310 K 1 A 12.3.
$C_K = 1.5$ to 5 pf so that $R_L = 920\ \Omega$. $C_1 = 6.5$ to 18 pf; $C_2 = 9.5$ to 20 pf. $C_s = 3$ to 10 pf.

* AQL = 0.65%

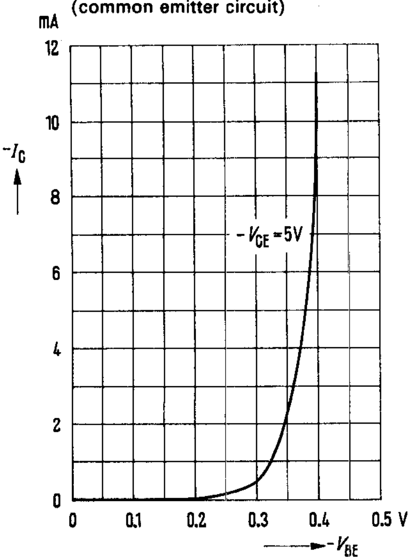
Maximum power dissipation
$P_{tot} = f(T)$



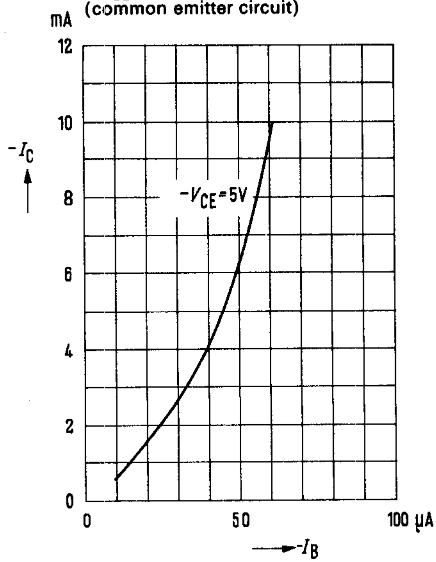
Cutoff current $I_{CBO} = f(T_{amb})$
$-V_{CBO} = 25$ V



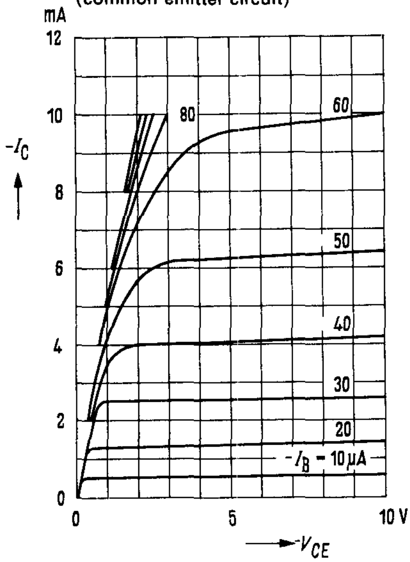
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 5$ V
(common emitter circuit)



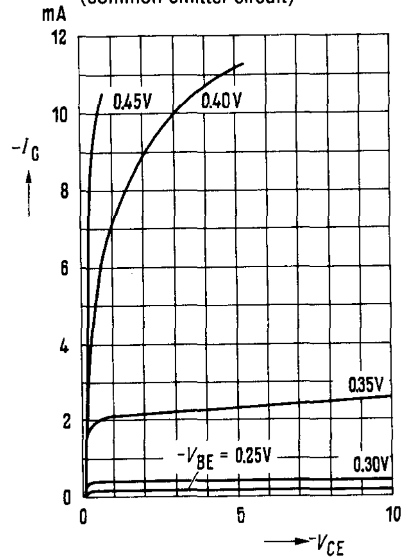
Collector current $I_C = f(I_B)$
$-V_{CE} = 5$ V
(common emitter circuit)



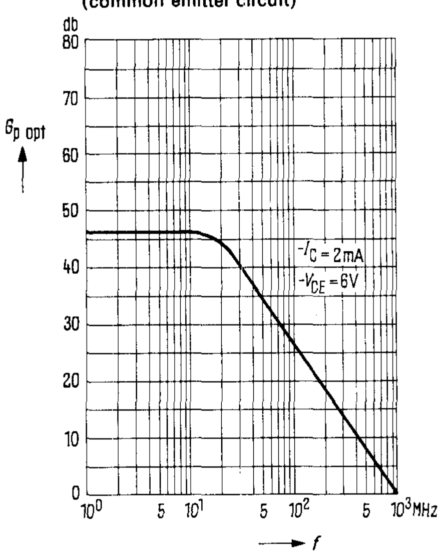
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter circuit)



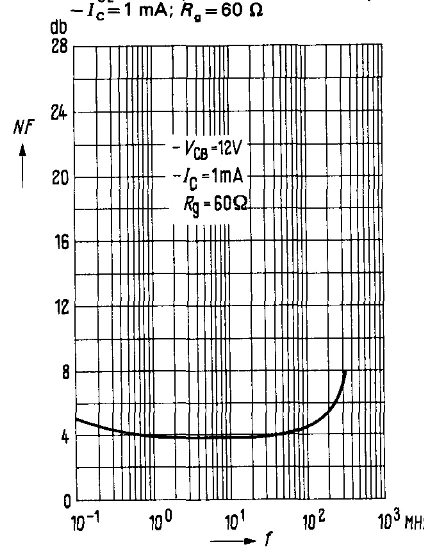
Output characteristics $I_C = f(V_{CE})$
V_{BE} = parameter
(common emitter circuit)



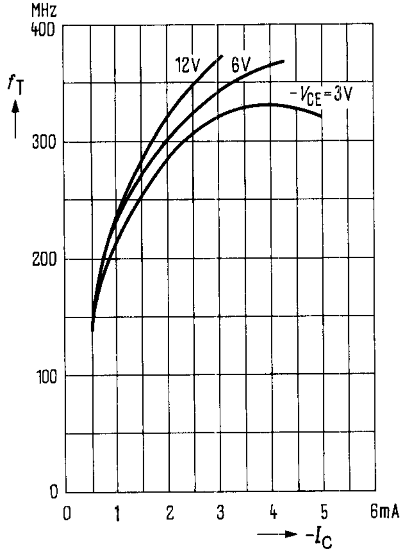
Optimum power gain $G_{p\,opt} = f(f)$
$-I_C = 2$ mA; $-V_{CE} = 6$ V
(common emitter circuit)



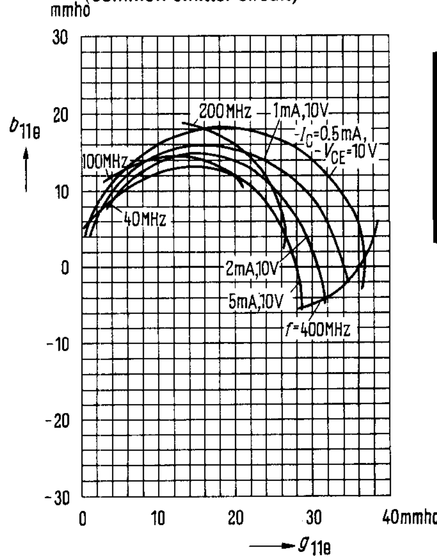
Noise figure $NF = f(f)$
$-V_{CE} = 12$ V (common base circuit)
$-I_C = 1$ mA; $R_g = 60\ \Omega$



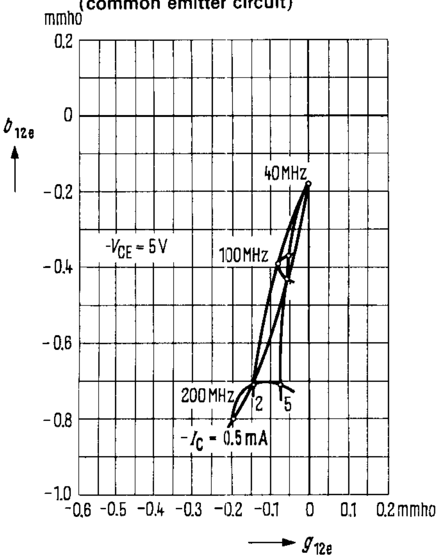
Current gain-bandwidth product
$f_T = f(I_C)$



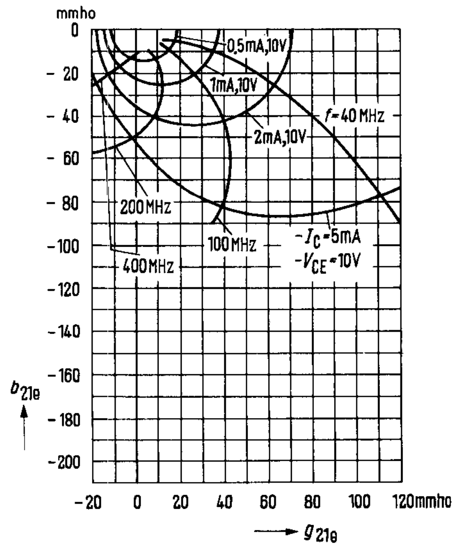
Small-signal short-circuit input admittance y_{11e}
(common emitter circuit)



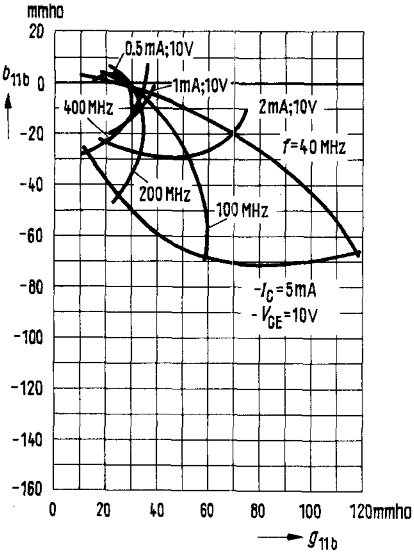
Small-signal short-circuit reverse transfer admittance y_{12e}
(common emitter circuit)



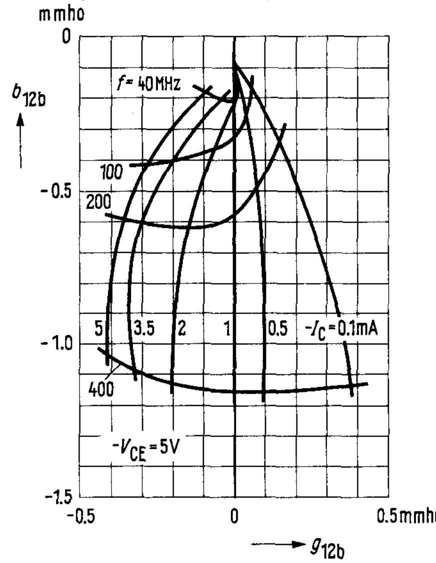
Small-signal short-circuit forward transfer admittance y_{21e}
(common emitter circuit)



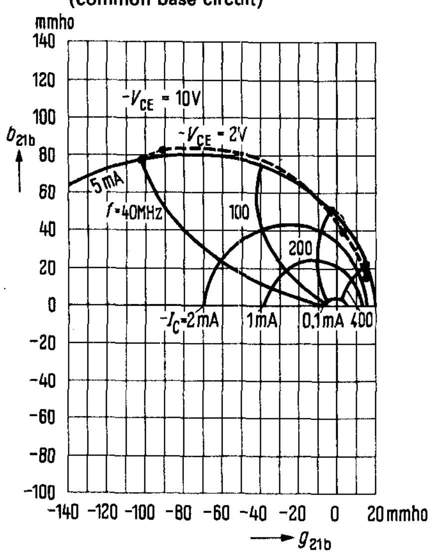
Small-signal short-circuit input admittance y_{11b} (common base circuit)



Small-signal short-circuit reverse transfer admittance y_{12b} (common base circuit)



Small-signal short-circuit forward transfer admittance y_{21b} (common base circuit)



Small-signal short-circuit output admittance y_{22} (common emitter and common base circuit)