

PNP Transistors for AF Input Stages

ACY 23  
ACY 32

SIEMENS AKTIENGESELLSCHAFT

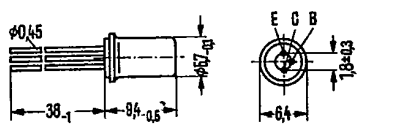
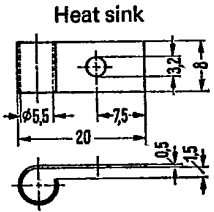
25C 04041 D

ACY 23 and ACY 32 are alloyed germanium PNP transistors in 1 A 3 DIN 41871 case (similar to TO-1). All leads are electrically insulated from the case. The collector terminal is marked by a red dot on the rim of the case. The transistors are particularly intended for use in AF input stages.

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Not for new design

Type	Ordering code
ACY 23 V	Q60103-Y23-E
ACY 23 VI	Q60103-Y23-F
ACY 32 V	Q60103-Y32-E
ACY 32 VI	Q60103-Y32-F
Heat sink	Q62901-B1



Approx. weight 1 g      Dimensions in mm

Thermal resistance between transistor case and heat sink below the fixing screw at careful mounting:  $R_{th} \leq 10 \text{ K/W}$

**Maximum ratings**

Collector-emitter voltage  
 Collector-emitter voltage ( $V_{BE} \geq 0.2 \text{ V}$ )  
 Collector-base voltage  
 Emitter-base voltage  
 Collector current  
 Base current  
 Junction temperature  
 Storage temperature range  
 Total power dissipation ( $T_{case} = 45 \text{ }^\circ\text{C}$ )

**Thermal resistance**

Junction to ambient air  
 Junction to case

	ACY 23, ACY 32	
$-V_{CEO}$	30	V
$-V_{CEV}$	32	V
$-V_{CBO}$	32	V
$-V_{EBO}$	16	V
$-I_C$	200	mA
$-I_B$	40	mA
$T_j$	90	$^\circ\text{C}$
$T_{stg}$	-55 to +75	$^\circ\text{C}$
$P_{tot}$	900	mW
$R_{thJA}$	$\leq 300$	K/W
$R_{thJC}$	$\leq 50$	K/W

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

ACY 23, ACY 32

	$T_{amb}$	25	60	$^\circ\text{C}$
Collector cutoff current ( $-V_{CBO} = 10\text{ V}$ )	$-I_{CBO}$	3 (<10)	60 (<100)	$\mu\text{A}$
Collector cutoff current ( $-V_{CBO} = 32\text{ V}$ )	$-I_{CBO}$	5 (<18)	<150	$\mu\text{A}$
Collector cutoff current ( $-V_{CEV} = 32\text{ V}; V_{BE} \geq 0.2\text{ V}$ )	$-I_{CEV}$	5 (<18)*	<150	$\mu\text{A}$
Emitter cutoff current ( $-V_{EBO} = 16\text{ V}$ )	$-I_{EBO}$	4 (<18)*	<120	$\mu\text{A}$

Static characteristics ( $T_{amb} = 25^\circ\text{C}$ ) ACY 23, ACY 32

$-V_{CE}$	$-I_C$ mA	$-I_B$ $\mu\text{A}$	$h_{FE}$ $I_C/I_B$	$V_{BE}$ V
0.5	2	30	67	0.13 (<0.2)
0.5	10	137	73	0.18 (<0.3)
0.5	100	1560	64	0.32 (<0.55)

Collector-emitter saturation voltage ( $I_C = 100\text{ mA}; I_B = 5\text{ mA}$ )	$-V_{CEsat}$	0.11 (<0.18)	V
Collector-emitter saturation voltage ( $-I_C = 200\text{ mA}$ for the characteristic which, at constant base current, intersects the operating point, where $-I_C = 220\text{ mA}$ and $-V_{CE} = 0.5\text{ V}$ )	$-V_{CEsat}$	0.25 (<0.4)	V

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

The transistors ACY 23 and ACY 32 are grouped according to the small-signal current gain  $h_{fe}$  and marked by Roman numerals.

Operating point:  $-I_C = 1\text{ mA}; -V_{CE} = 5\text{ V}; f = 1\text{ kHz}$

$h_{fe}$ group	V	VI	
$h_{fe}$	50 to 100 ACY 23	75 to 150* ACY 32	-
Operating point: $-I_C = 1\text{ mA}; -V_{CE} = 5\text{ V}$			
Transition frequency	$f_T$	1.5 (>0.5)	1.5 (>0.5) MHz
Base intrinsic resistance	$r_{bb'}$	75 (<200)	75 (<200) $\Omega$
Collector-junction capacitance	$C_{b'c}$	27	27 pF
Noise figure ( $-I_C = 0.5\text{ mA}; -V_{CE} = 5\text{ V}; f = 1\text{ kHz}; \Delta f = 200\text{ Hz}; R_g = 500\ \Omega$ )	NF	4 (<10)*	3 (<6)* dB
Operating point: $-I_C = 1\text{ mA}; -V_{CE} = 5\text{ V}; f = 1\text{ kHz}$			
	$h_{11e}$	3 (1.2 to 5)	3 (1.2 to 5) k $\Omega$
	$h_{12e}$	7 (<15)	7 (<15) $10^{-4}$
	$h_{fe} = h_{21e}$	100 (50 to 150)	-
	$h_{22e}$	40 (<75)	40 (<75) $\mu\text{S}$

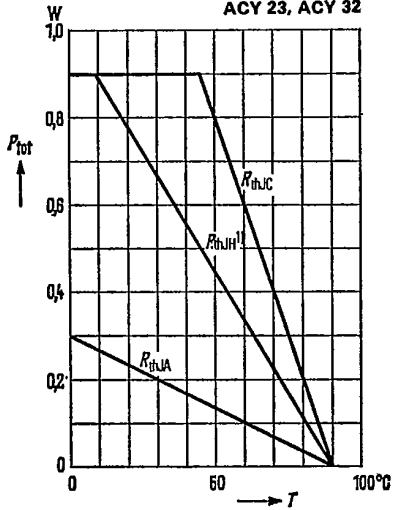
\* AQL = 0.65%

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Total perm. power dissipation versus temperature

$P_{tot} = f(T); R_{th} = \text{parameter}$

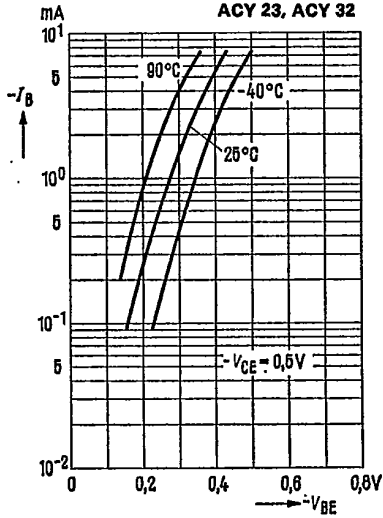
ACY 23, ACY 32



1) Heat sink aluminum 12.5 cm<sup>2</sup> x 2 mm

Input characteristics  $I_B = f(V_{BE})$   
 $-V_{CE} = 0.5 \text{ V}; T_{amb} = \text{parameter}$   
(common emitter configuration)

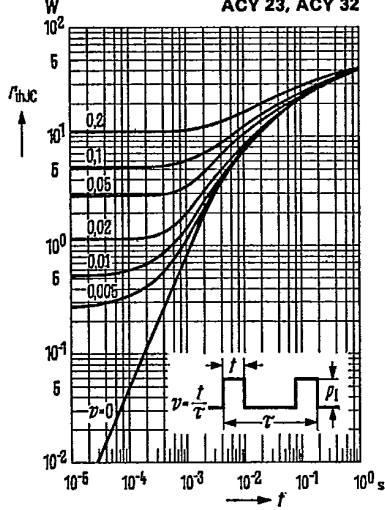
ACY 23, ACY 32



Permissible pulse load

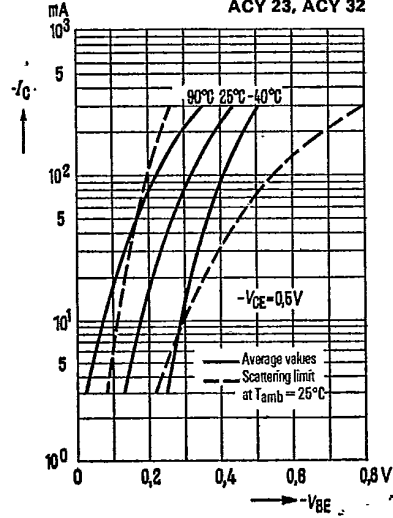
$r_{thJC} = f(t); v = \text{parameter}$

ACY 23, ACY 32



Collector current  $I_C = f(V_{BE})$   
 $-V_{CE} = 0.5 \text{ V}; T_{amb} = \text{parameter}$   
(common emitter configuration)

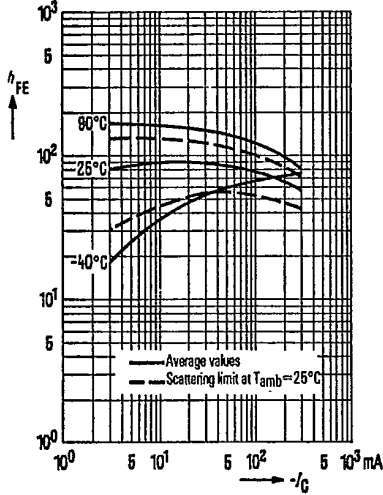
ACY 23, ACY 32



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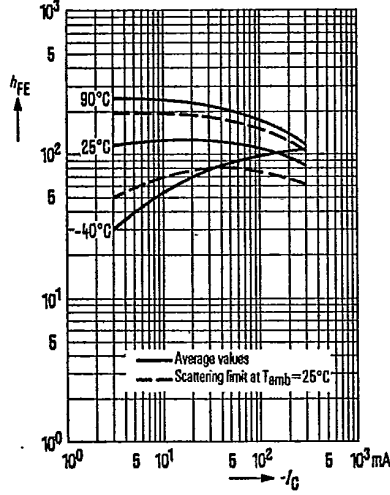
DC current gain  $h_{FE} = f(I_C)$   
 $-V_{CE} = 0.5 \text{ V}; T_{amb} = \text{parameter}$   
 (common emitter configuration)

ACY 23 V, ACY 32 V



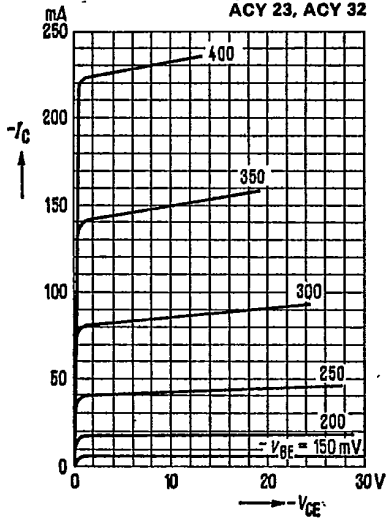
DC current gain  $h_{FE} = f(I_C)$   
 $-V_{CE} = 0.5 \text{ V}; T_{amb} = \text{parameter}$   
 (common emitter configuration)

ACY 23 VI, ACY 32 VI



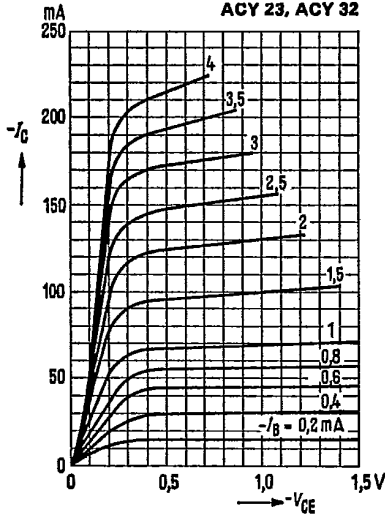
Output characteristics  
 $I_C = f(V_{CE}); I_B = \text{parameter}$   
 (common emitter configuration)

ACY 23, ACY 32



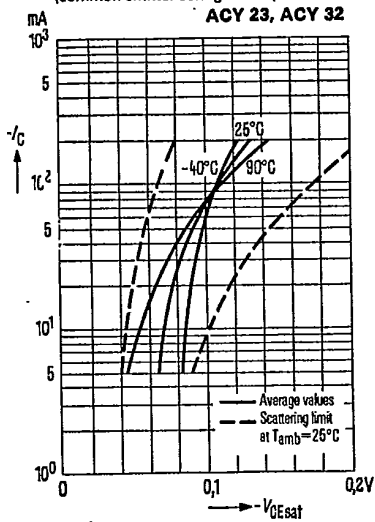
Output characteristics  
 $I_C = f(V_{CE}); I_B = \text{parameter}$   
 (common emitter configuration)

ACY 23, ACY 32



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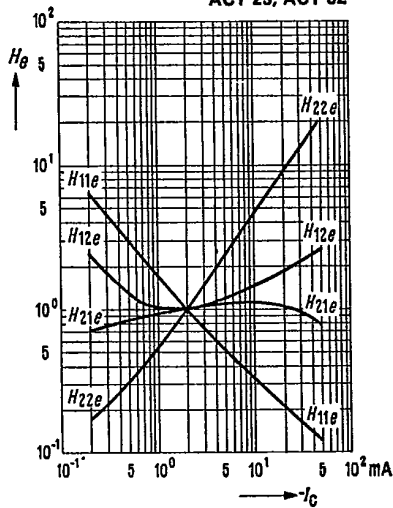
**Collector-emitter saturation voltage**  
 $V_{CEsat} = f(I_C); h_{FE} = 20; T_{amb} = \text{parameter}$   
 (common emitter configuration)



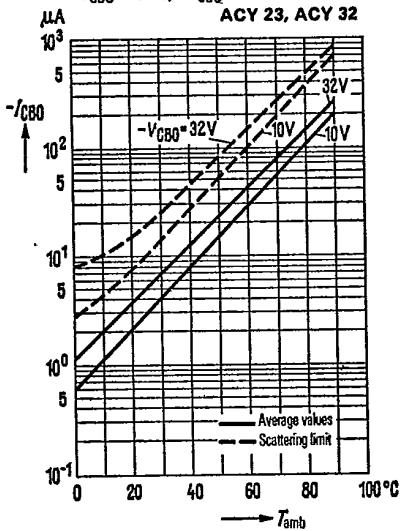
**h-parameter versus collector current**

$$H_o = \frac{h_o(I_C)}{h_o(I_C = -2 \text{ mA})} = f(I_C)$$

$-V_{CE} = 1 \text{ V}; f = 1 \text{ kHz}$



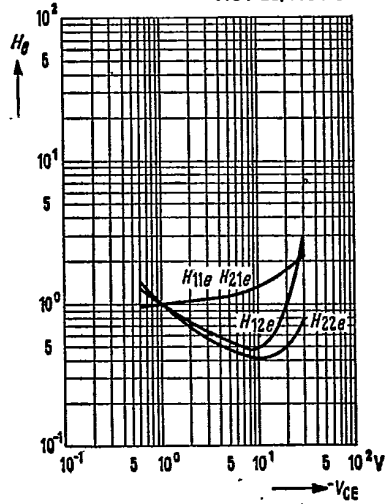
**Collector cutoff current versus temperature**  
 $I_{CBO} = f(T_{amb})$   
 $-V_{CB0} = 32 \text{ V}; -V_{CB0} = 10 \text{ V}$



**h-parameter versus collector-emitter voltage**

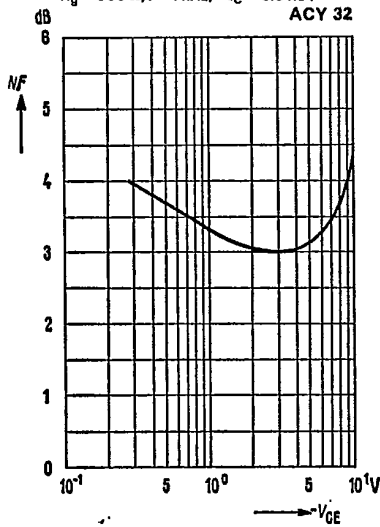
$$H_o = \frac{h_o(V_{CE})}{h_o(V_{CE} = -1 \text{ V})} = f(V_{CE})$$

$-I_C = 2 \text{ mA}; f = 1 \text{ kHz}$

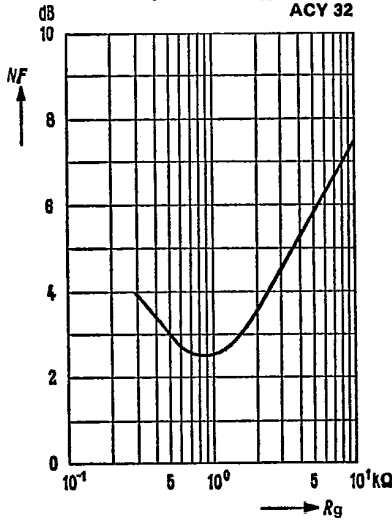


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Noise figure versus collector-emitter voltage  $NF = f(V_{CE})$   
 $R_g = 500 \Omega; f = 1 \text{ kHz}; -I_C = 0.5 \text{ mA}$



Noise figure versus internal resistance of generator  $NF = f(R_g)$   
 $f = 1 \text{ kHz}; -I_C = 0.5 \text{ mA}; -V_{CE} = 5 \text{ V}$



Noise figure versus collector current  $NF = f(I_C)$   
 $R_g = 500 \Omega; -V_{CE} = 5 \text{ V}; f = 1 \text{ kHz}$

