

PNP Germanium Transistors

SIEMENS AKTIENGESELLSCHAFT C 04035 D **AC 151**
AC 151 r

T-29-11

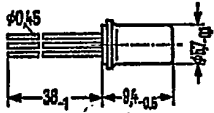
for AF input and driver stages of medium performance

AC 151 and AC 151 r are alloyed germanium PNP transistors in 1A 3 DIN 41871 case (similar to TO-1).

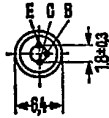
The leads of these transistors are electrically insulated from the case. The collector terminal is marked by a red dot at the rim of the case. A fixing part (heat sink¹⁾) is provided for fixing on the chassis; it has to be ordered separately.

Not for new design

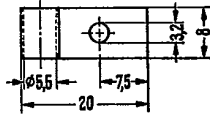
Type	Ordering code
AC 151 IV	Q60103-X151-D
AC 151 rIV	Q60103-X151-D1
AC 151 V	Q60103-X151-E
AC 151 rV	Q60103-X151-E1
AC 151 VI	Q60103-X151-F
AC 151 rVI	Q60103-X151-F1
AC 151 VII	Q60103-X151-G
Heat sink	Q62901-B1



Approx. weight 1 g



Dimensions in mm



Approx. weight 2 g

Maximum ratings

	AC 151	AC 151 r	
Collector-emitter voltage	-V _{CEO}	24	V
Collector-emitter voltage (V _{BE} ≥ 0.2 V)	-V _{CEV}	32	V
Collector-base voltage	-V _{CB0}	32	V
Emitter-base voltage	-V _{EBO}	10	V
Collector current	-I _C	200	mA
Base current	-I _B	40	mA
Junction temperature	T _j	90	°C
Storage temperature range	T _{stg}	-55 to +75	°C
Total power dissipation	P _{tot}	900	mW

Thermal resistance

Junction to ambient air	R _{thJA}	≤ 300	K/W
Junction to case	R _{thJC}	≤ 50	K/W

1) Thermal resistance between transistor case and heat sink below the fixing screw at careful mounting: R_{th} ≤ 10 K/W

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Static characteristics ($T_{amb} = 25^\circ\text{C}$)³⁾

	AC 151 AC 151 r	
Collector-emitter saturation voltage ($-I_C = 200\text{ mA}$; $h_{FE} = 20$)	$-V_{CEsat}$ ¹⁾ 0.13 (<0.22)	V
Collector-emitter saturation voltage	$-V_{CEsat}$ 0.25 (<0.4) ²⁾	V
Collector cutoff current ($V_{CBO} = 10\text{ V}$)	$-I_{CBO}$ <10	μA
Collector cutoff current ($V_{CBO} = 32\text{ V}$)	$-I_{CBO}$ 6 (<25)	μA
Collector cutoff current ($-V_{CEV} = 32\text{ V}$; $V_{BE} \geq 0.2\text{ V}$)	$-I_{CEV}$ 6 (<25)	μA
Emitter cutoff current ($-V_{EBO} = 10\text{ V}$)	$-I_{EBO}$ 4 (<25)	μA

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

	AC 151	AC 151 r	
Cutoff frequency ($-I_C = 1\text{ mA}$; $-V_{CE} = 5\text{ V}$)	f_{hfe} 15	15	kHz
Transition frequency	f_T 1.5	1.5	MHz
Base intrinsic resistance	$r_{bb'}$ 75	75	Ω
Collector-junction capacitance	$C_{b'e}$ 27	27	pF
Noise figure ($-I_C = 0.5\text{ mA}$; $-V_{CE} = 5\text{ V}$; $f = 200\text{ Hz}$; $R_g = 500\ \Omega$; $f = 1\text{ kHz}$)	NF 4 (<10)	3 (<6)	dB

The transistors AC 151 and AC 151r are grouped according to the small signal current gain h_{fe} and marked by Roman numerals.

Operating point: ($-I_C = 2\text{ mA}$; $-V_{CE} = 1\text{ V}$; $f = 1\text{ kHz}$)

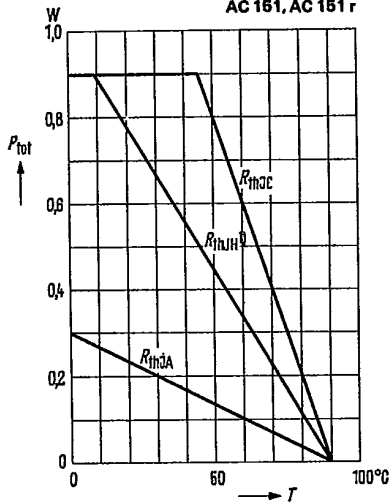
h_{fe} group	IV	V	VI	VII	
Type	AC 151 r	AC 151 r	AC 151 r	-	
	AC 151	AC 151	AC 151	AC 151	
h_{11e}	0.75 (0.4 to 1.3)	1.2 (0.6 to 2.1)	1.8 (1.0 to 3.2)	2.7 (1.7 to 5.3)	k Ω
h_{12e}	9 (<20)	13 (<25)	16 (<28)	19 (<30)	10^{-4}
h_{21e}	45 (30 to 60)	75 (50 to 100)	110 (75 to 150)	170 (125 to 250)	-
h_{22e}	100 (<200)	140 (<250)	160 (<280)	160 (<300)	μS

1) The transistor is overloaded to such a degree that the DC current gain decreases to $h_{FE} = 20$.
 2) ($-I_C = 200\text{ mA}$ for the characteristic which, at a constant base current, intersects the operating point, where $-I_C = 200\text{ mA}$; $-V_{CE} = 0.5\text{ V}$)
 3) See also next page

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Total perm. power dissipation versus temperature

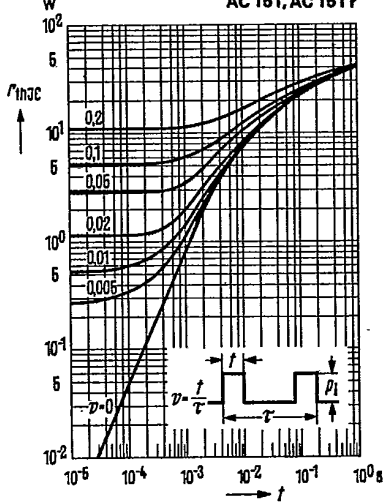
$P_{tot} = f(T); R_{th} = \text{parameter}$
 AC 151, AC 151 r



1) Heat sink: aluminum 12.5 cm² x 2 mm

Permissible pulse load

$i_{th,C} = f(t); v = \text{parameter}$
 AC 151, AC 151 r

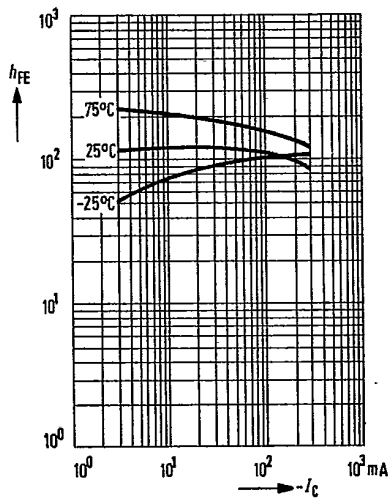


Static characteristics ($T_{amb} = 25^\circ\text{C}$)
 $-V_{CE} = 0,5 \text{ V}$

Type	AC 151, 151 r		
$-I_C$ mA	$-I_B$ mA	h_{FE} I_C/I_B	$-V_{BE}$ V
2	0,043	47	0,125 ($<0,2$)
10	0,2	50	0,18 ($<0,3$)
50	-	-	-
100	2,222	45	0,32 ($<0,55$)
200	5	40	0,39 ($<0,7$)

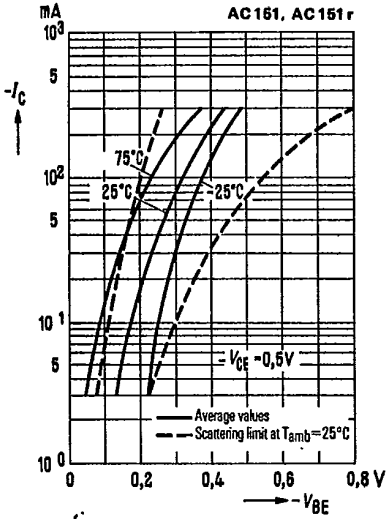
DC current gain $h_{FE} = f(I_C)$
 $-V_{CE} = 0,5 \text{ V}; T_{amb} = \text{parameter}$
 (common emitter configuration)

AC 151, AC 151 r

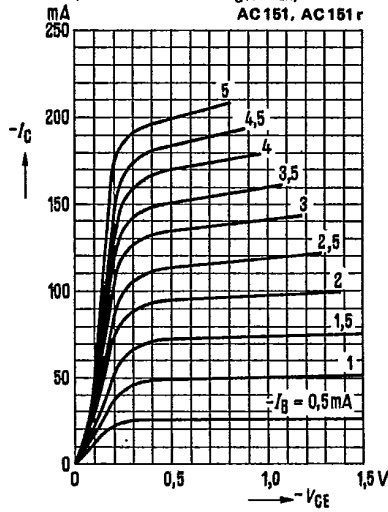


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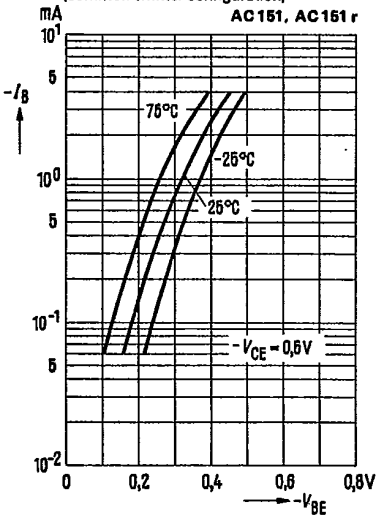
Collector current $I_C = f(V_{BE})$
 $-V_{CE} = 0.5 \text{ V}; T_{amb} = \text{parameter}$
 (common emitter configuration)



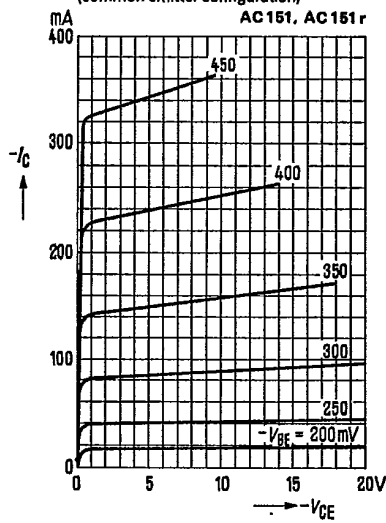
Output characteristics
 $I_C = f(V_{CE}); I_B = \text{parameter}$
 (common emitter configuration)



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



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



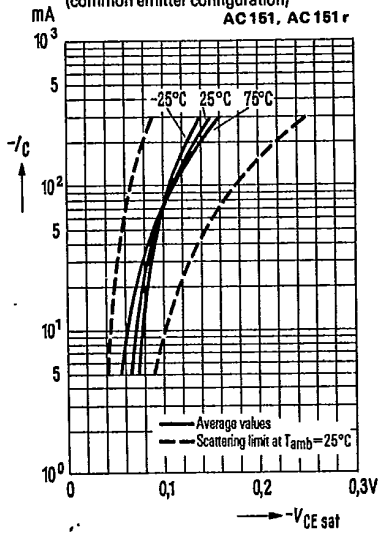
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Collector-emitter saturation voltage

$V_{CEsat} = f(I_C); h_{FE} = 20$

(common emitter configuration)

AC 151, AC 151 r

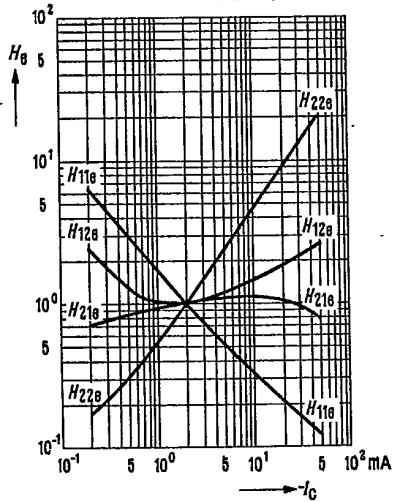


h-parameter versus collector current

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

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

AC 151, AC 151 r

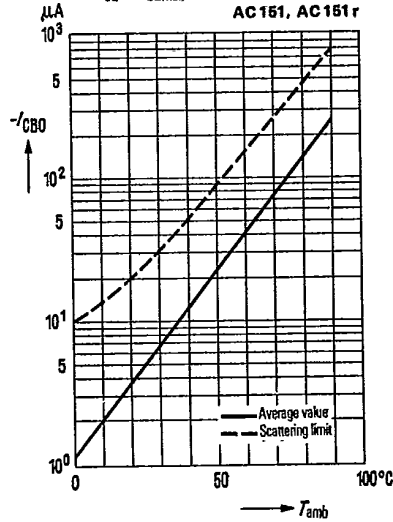


Collector cutoff current versus temperature

$I_{CBO} = f(T_{amb})$

For $V_{CE} = V_{CEmax}$

AC 151, AC 151 r

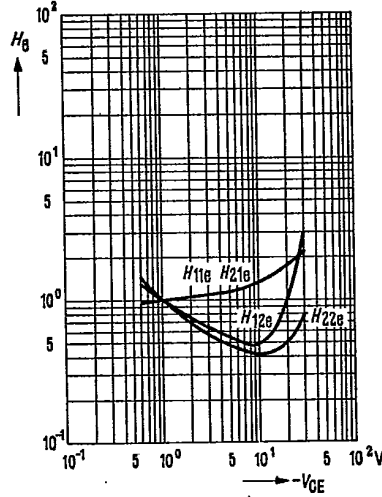


h-parameter versus collector-emitter voltage

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

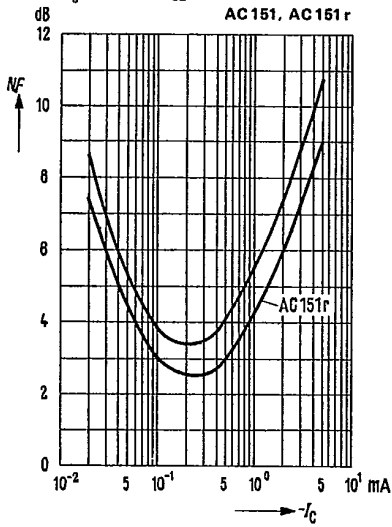
$-I_C = 2 \text{ mA}; f = 1 \text{ kHz}$

AC 151, AC 151 r

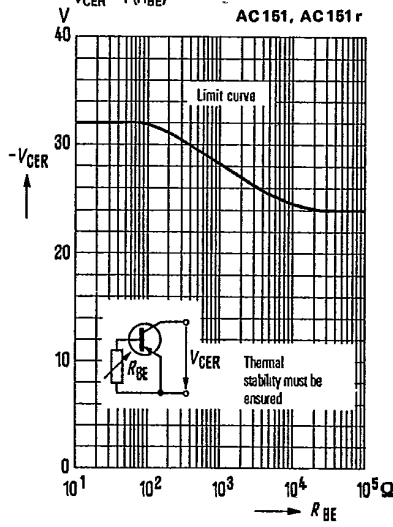


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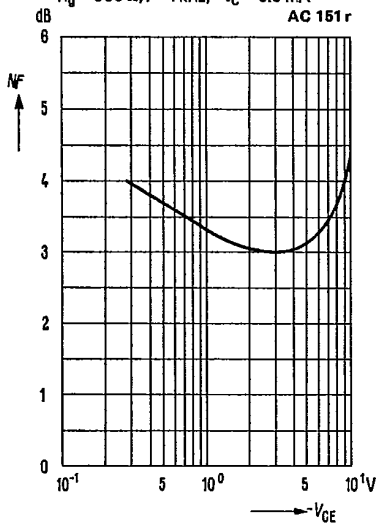
Noise figure versus collector current $NF = f(I_C)$
 $R_g = 500 \Omega; -V_{CE} = 5 V; f = 1 \text{ kHz}$



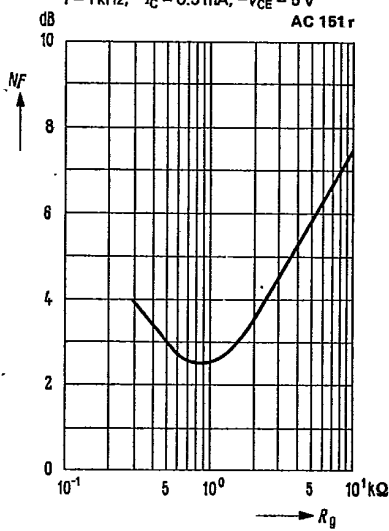
Collector-emitter voltage $V_{CER} = f(R_{BE})$



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 $NF = f(R_g)$
 $f = 1 \text{ kHz}; -I_C = 0.5 \text{ mA}; -V_{CE} = 5 V$





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