

**PNP Germanium Transistors**

SIEMENS AKTIENGESELLSCHAFT C 04035 D

**AC 151**  
**AC 151 r**

T-29-11

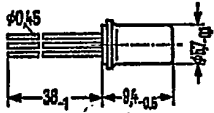
for AF input and driver stages of medium performance

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

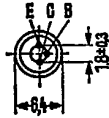
The leads of these transistors are electrically insulated from the case. The collector terminal is marked by a red dot at the rim of the case. A fixing part (heat sink<sup>1)</sup>) is provided for fixing on the chassis; it has to be ordered separately.

Not for new design

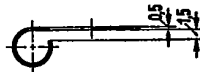
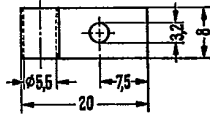
Type	Ordering code
AC 151 IV	Q60103-X151-D
AC 151 rIV	Q60103-X151-D1
AC 151 V	Q60103-X151-E
AC 151 rV	Q60103-X151-E1
AC 151 VI	Q60103-X151-F
AC 151 rVI	Q60103-X151-F1
AC 151 VII	Q60103-X151-G
Heat sink	Q62901-B1



Approx. weight 1 g



Dimensions in mm



Approx. weight 2 g

**Maximum ratings**

	AC 151 AC 151 r	
Collector-emitter voltage	-V <sub>CEO</sub>	24 V
Collector-emitter voltage (V <sub>BE</sub> ≥ 0.2 V)	-V <sub>CEV</sub>	32 V
Collector-base voltage	-V <sub>CB0</sub>	32 V
Emitter-base voltage	-V <sub>EBO</sub>	10 V
Collector current	-I <sub>C</sub>	200 mA
Base current	-I <sub>B</sub>	40 mA
Junction temperature	T <sub>j</sub>	90 °C
Storage temperature range	T <sub>stg</sub>	-55 to +75 °C
Total power dissipation	P <sub>tot</sub>	900 mW
<b>Thermal resistance</b>		
Junction to ambient air	R <sub>thJA</sub>	≤ 300 K/W
Junction to case	R <sub>thJC</sub>	≤ 50 K/W

1) Thermal resistance between transistor case and heat sink below the fixing screw at careful mounting: R<sub>th</sub> ≤ 10 K/W

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**Static characteristics ( $T_{amb} = 25^\circ\text{C}$ )<sup>3)</sup>**

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

**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	$\Omega$
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.

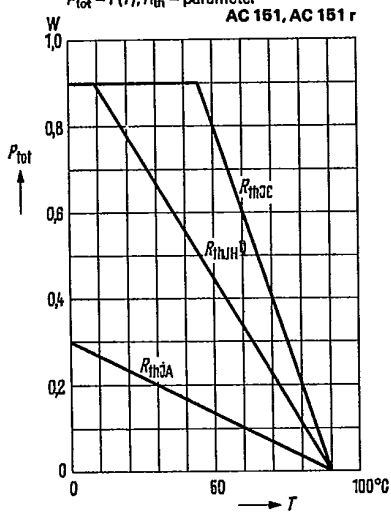
Operating point: ( $-I_C = 2\text{ mA}$ ;  $-V_{CE} = 1\text{ V}$ ;  $f = 1\text{ kHz}$ )

$h_{fe}$ 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 $\Omega$
$h_{12e}$	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)	$\mu\text{S}$

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

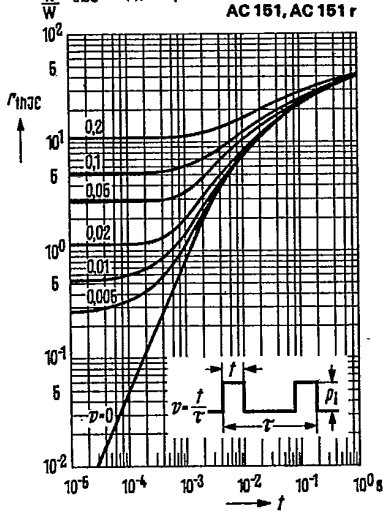
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Total perm. power dissipation versus temperature  
 $P_{tot} = f(T); R_{th} = \text{parameter}$



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

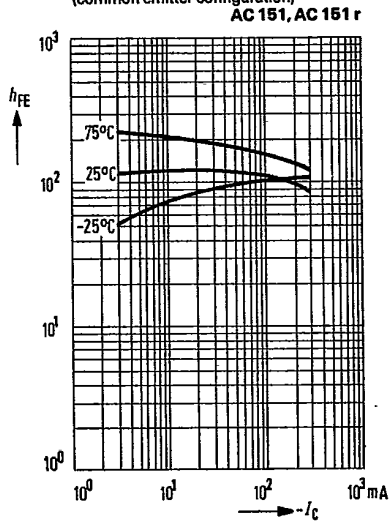
Permissible pulse load  
 $r_{thJC} = f(t); v = \text{parameter}$



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

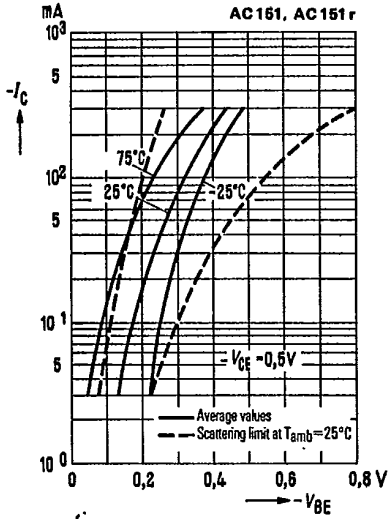
Type	AC 151, 151 r		
$-I_C$ mA	$-I_B$ mA	$h_{FE}$ $I_C/I_B$	$-V_{BE}$ V
2	0,043	47	0,125 ( $<0,2$ )
10	0,2	50	0,18 ( $<0,3$ )
50	-	-	-
100	2,222	45	0,32 ( $<0,55$ )
200	5	40	0,39 ( $<0,7$ )

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

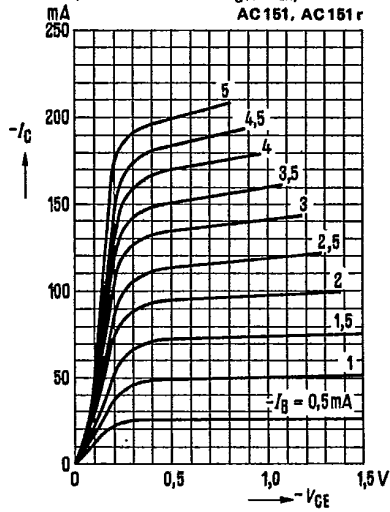


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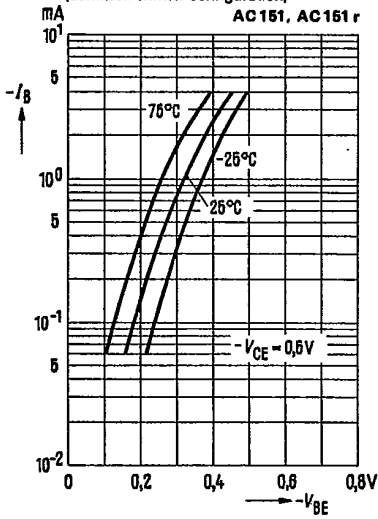
Collector current  $I_C = f(V_{BE})$   
 $-V_{CE} = 0.5 \text{ V}; T_{amb} = \text{parameter}$   
 (common emitter configuration)



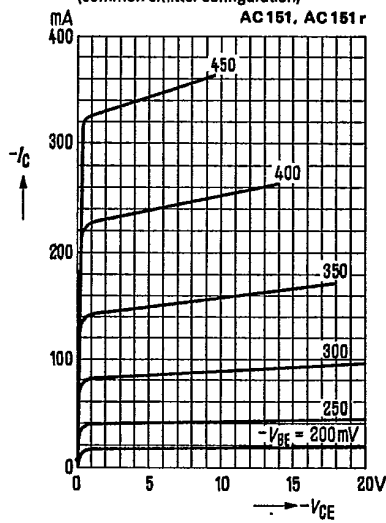
Output characteristics  
 $I_C = f(V_{CE}); I_B = \text{parameter}$   
 (common emitter configuration)



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)



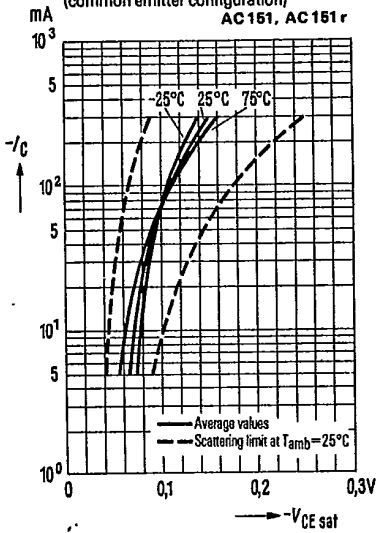
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**Collector-emitter saturation voltage**

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

(common emitter configuration)

AC 151, AC 151 r

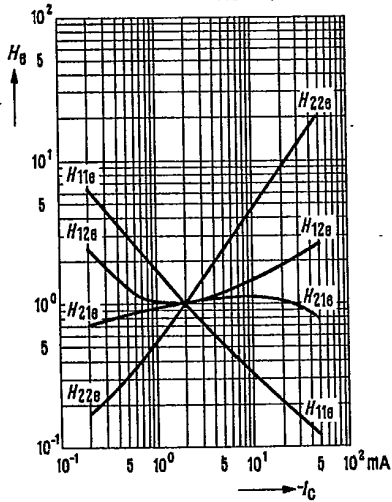


**h-parameter versus collector current**

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

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

AC 151, AC 151 r

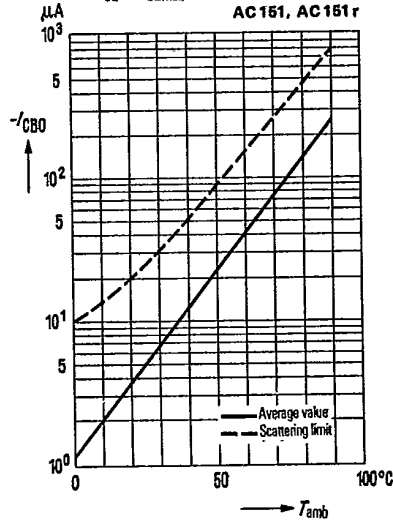


**Collector cutoff current versus temperature**

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

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

AC 151, AC 151 r

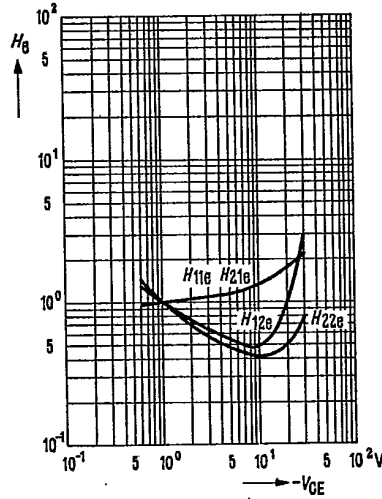


**h-parameter versus collector-emitter voltage**

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

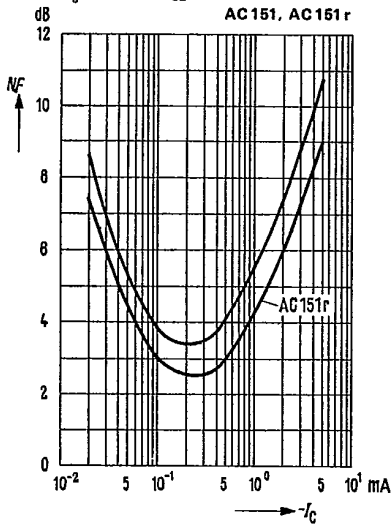
$-I_C = 2 \text{ mA}; f = 1 \text{ kHz}$

AC 151, AC 151 r

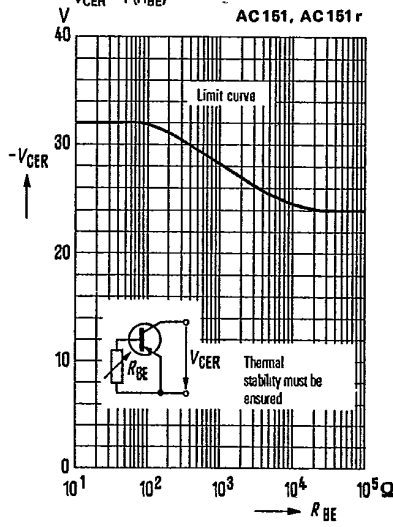


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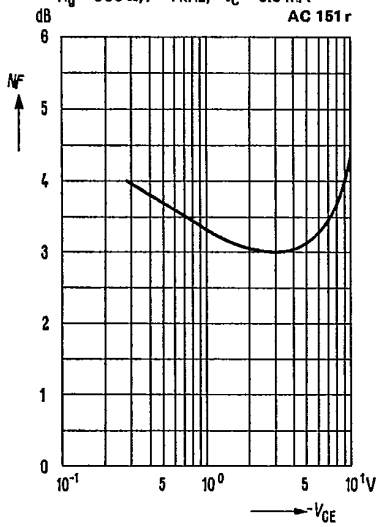
Noise figure versus collector current  $NF = f(I_C)$   
 $R_g = 500 \Omega; -V_{CE} = 5 V; f = 1 \text{ kHz}$



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

