PNP Germanium Transistors

AC 151
AC 151 r

SIEMENS AKTIENGESELLSCHAF C 04035 D

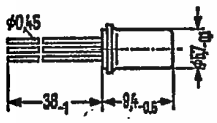
T-29-11

for AF input and driver stages of medium performance

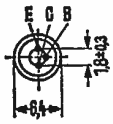
AC 151 and AC 151 r are alloyed germanium PNP transistors in 1A 3 DIN 41871 case (similar to TO-1).
The leads of these transistors are electrically insulated from the case. The collector terminal is marked by a red dot at the rim of the case. A fixing part (heat sink[1]) is provided for fixing on the chassis; it has to be ordered separately.

Not for new design

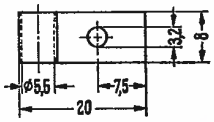
Type	Ordering code
AC 151 IV	Q60103-X151-D
AC 151 rIV	Q60103-X151-D1
AC 151 V	Q60103-X151-E
AC 151 rV	Q60103-X151-E1
AC 151 VI	Q60103-X151-F
AC 151 rVI	Q60103-X151-F1
AC 151 VII	Q60103-X151-G
Heat sink	Q62901-B1



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 ($V_{BE} \geq 0.2$ V)	$-V_{CEV}$	32	V
Collector-base voltage	$-V_{CBO}$	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: $R_{th} \leq 10$ K/W

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Static characteristics (T_{amb} = 25 °C)[3]			AC 151 AC 151 r	
Collector-emitter saturation voltage ($-I_C$ = 200 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 V)	$-I_{CBO}$	<10	µA
Collector cutoff current	(V_{CBO} = 32 V)	$-I_{CBO}$	6 (<25)	µA
Collector cutoff current	($-V_{CEV}$ = 32 V); (V_{BE}≧0.2 V)	$-I_{CEV}$	6 (<25)	µA
Emitter cutoff current	($-V_{EBO}$ = 10 V)	$-I_{EBO}$	4 (<25)	µA

Dynamic characteristics (T_{amb} = 25 °C)		AC 151	AC 151r	
Cutoff frequency ($-I_C$ = 1 mA; $-V_{CE}$ = 5 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 mA; $-V_{CE}$ = 5 V; f = 200 Hz; R_g = 500 Ω; f = 1 kHz)	NF	4 (<10)	3 (<6)	dB

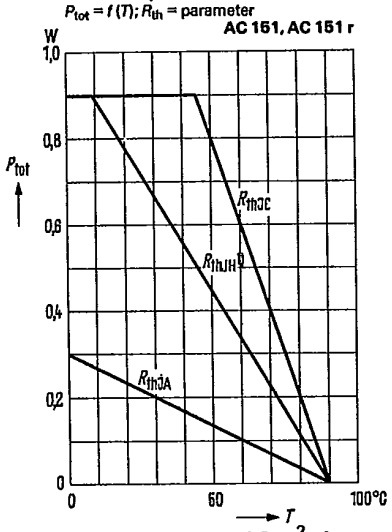
The transistors AC 151 and AC 151r are grouped according to the small signal current gain h_{fe} and marked by Roman numerals.

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

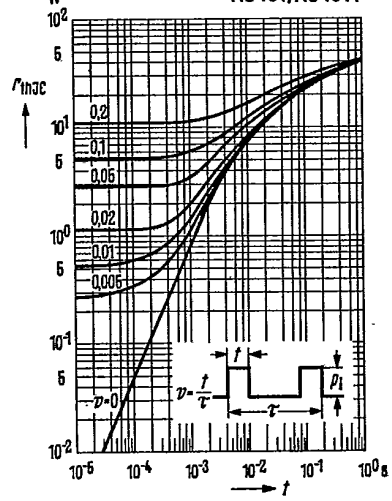
1) The transistor is overloaded to such a degree that the DC current gain decreases to h_{FE} = 20.
2) ($-I_C$ = 200 mA for the characteristic which, at a constant base current, intersects the operating point, where $-I_C$ = 200 mA; $-V_{CE}$ = 0.5 V)
3) See also next page

Total perm. power dissipation versus temperature
$P_{tot} = f(T)$; R_{th} = parameter
AC 151, AC 151 r

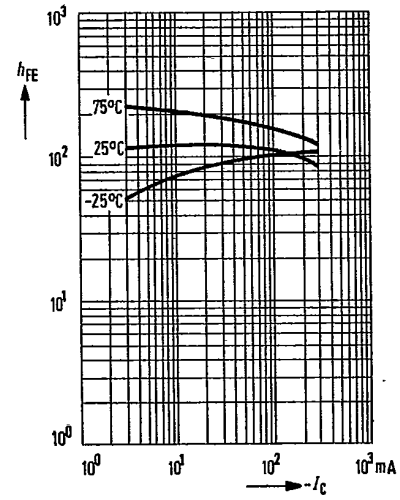


1) Heat sink: aluminum 12.5 cm^2 x 2 mm

Permissible pulse load
$\frac{K}{W}$ $r_{thJC} = f(t)$; v = parameter
AC 151, AC 151 r



DC current gain $h_{FE} = f(I_C)$
$-V_{CE}$ = 0.5 V; T_{amb} = parameter
(common emitter configuration)
AC 151, AC 151 r



Static characteristics (T_{amb} = 25 °C)
$-V_{CE}$ = 0,5 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)

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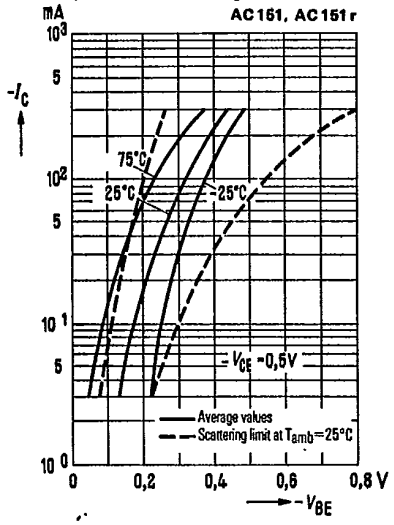
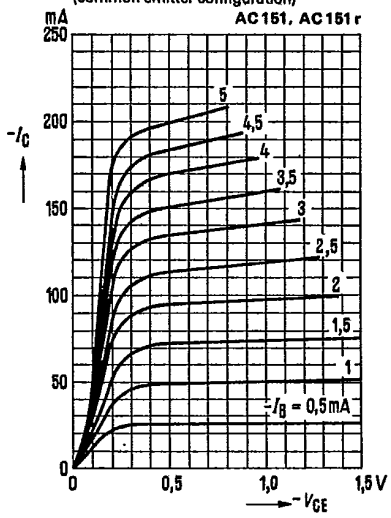
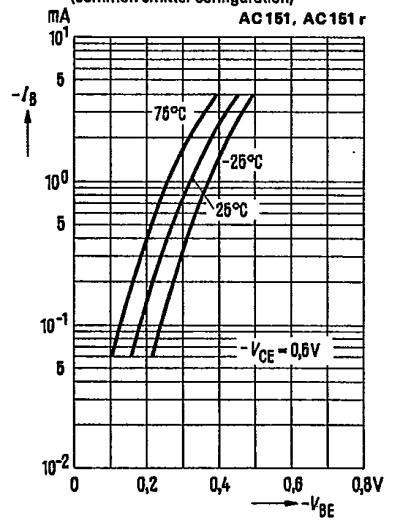
Collector current $I_C = f(V_{BE})$
$-V_{CE} = 0.5$ V; T_{amb} = parameter
(common emitter configuration)



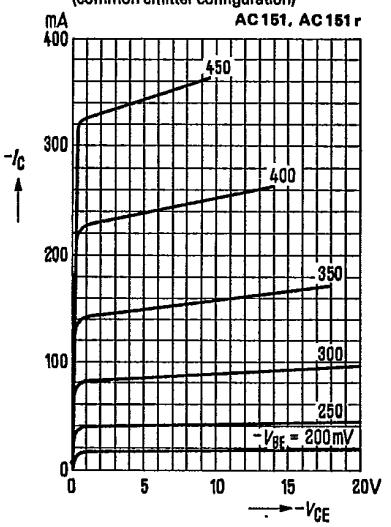
Output characteristics
$I_C = f(V_{CE})$; I_B = parameter
(common emitter configuration)



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



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



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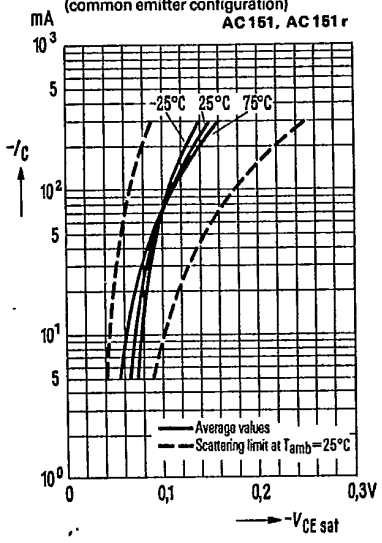
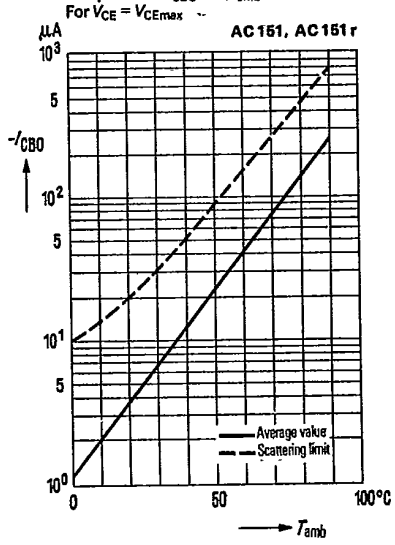
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$; $h_{FE} = 20$
(common emitter configuration)



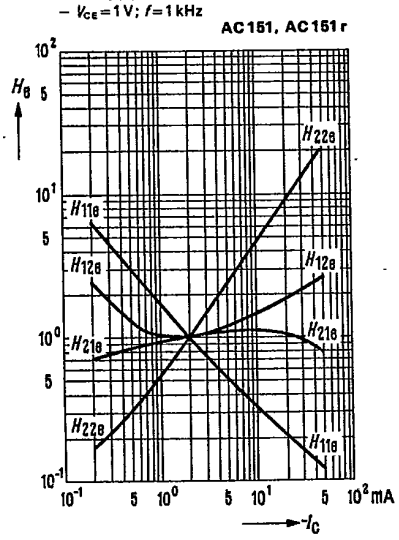
Collector cutoff current versus temperature $I_{CBO} = f(T_{amb})$;
For $V_{CE} = V_{CEmax}$



h-parameter versus collector current

$H_e = \frac{h_e(I_C)}{h_e(I_C = -2\,mA)} = f(I_C)$

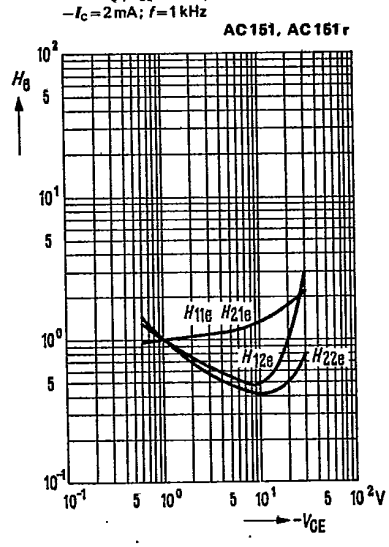
$-V_{CE} = 1\,V$; $f = 1\,kHz$



h-parameter versus collector-emitter voltage

$H_e = \frac{h_e(V_{CE})}{h_e(V_{CE} = -1\,V)} = f(V_{CE})$

$-I_C = 2\,mA$; $f = 1\,kHz$



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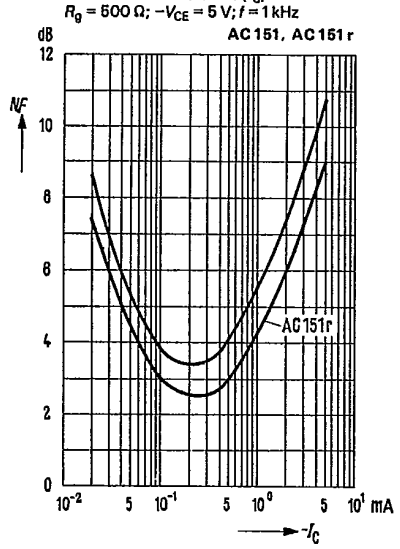

Collector-emitter voltage $V_{CER} = f(R_{BE})$
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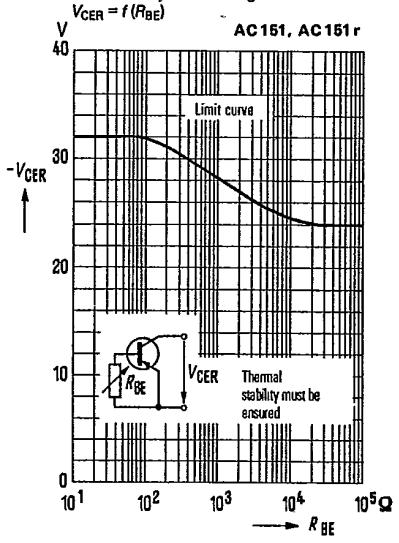

Noise figure versus collector-emitter voltage $NF = f(V_{CE})$
$R_g = 500\ \Omega$; $f = 1$ kHz; $-I_C = 0.5$ mA
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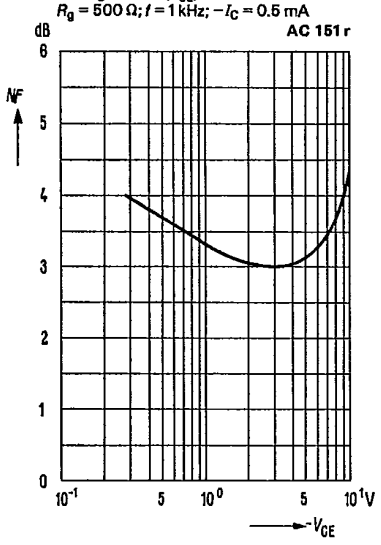

Noise figure versus internal resistance of generator $NF = f(R_g)$:
$f = 1$ kHz; $-I_C = 0.5$ mA; $-V_{CE} = 5$ V
AC 151 r