

N-P-N SILICON PLANAR EPITAXIAL TRANSISTORS

BC147
BC148
BC149

N-P-N silicon planar epitaxial transistors in plastic encapsulation with three rigid self-locking strips suitable for insertion in printed circuit boards using standard grids.

The BC147 is primarily intended for use in audio driver stages and television signal processing circuits.

The BC148 is a general purpose l.f. transistor.

The BC149 is primarily intended for low noise audio input stages.

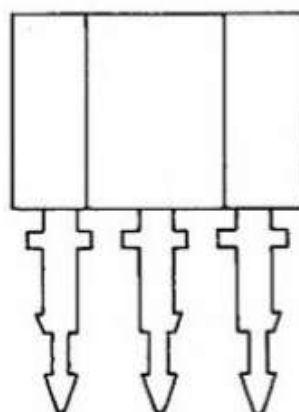
QUICK REFERENCE DATA

		BC147	BC148	BC149	
$V_{CES}^{max.}$		50	30	30	V
$V_{CEO}^{max.}$		45	20	20	V
$I_{CM}^{max.}$		200	200	200	mA
$P_{tot}^{max.}$ ($T_{amb} \leq 25^{\circ}C$)		350	350	350	mW
$T_j^{max.}$		125	125	125	$^{\circ}C$
h_{fe} ($I_C = 2mA$, $V_{CE} = 5V$, $f = 1kHz$)	min.	125	125	240	
	max.	500	900	900	
f_T ($I_C = 10mA$, $V_{CE} = 5V$, $f = 35MHz$)	typ.	300	300	300	MHz
N ($I_C = 200\mu A$, $V_{CE} = 5V$, $R_S = 2k\Omega$)					
$f = 30Hz$ to $15kHz$	typ.	-	-	1.4	dB
	max.	-	-	4.0	dB
$f = 1kHz$, $B = 200Hz$	max.	10	10	4.0	dB

Unless otherwise stated data are applicable to all types

OUTLINE AND DIMENSIONS

For details see page 5.



Front View
Scale 3:1

D5542

N.B. Devices in this Data Sheet should be ordered by the type number followed by Reference 0220.

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RATINGS

Limiting values of operation according to the absolute maximum system.

Electrical

	BC147	BC148	BC149	
V_{CBO} max.	50	30	30	V
V_{CES} max.	50	30	30	V
V_{CEO} max.	45	20	20	V
V_{EBO} max.	6.0	5.0	5.0	V
I_C max.	100	100	100	mA
I_{CM} max.	200	200	200	mA
$-I_{EM}$ max.	200	200	200	mA
I_{BM} max.	200	200	200	mA
P_{tot} max. ($T_{amb} \leq 25^\circ\text{C}$)	350	350	350	mW

Temperature

T_{stg} range	-65 to +125	$^\circ\text{C}$
T_j max.	125	$^\circ\text{C}$

THERMAL CHARACTERISTICS

$R_{th(j-amb)}$	0.275	$^\circ\text{C}/\text{mW}$
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ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$ unless otherwise stated)

		Min.	Typ.	Max.	
I_{CBO}	Collector cut-off current $V_{CB} = 20\text{V}$, $I_E = 0$, $T_j = 125^\circ\text{C}$	-	-	5.0	μA
	$V_{CB} = 20\text{V}$, $I_E = 0$	-	0.01	0.6	μA
V_{BE}	*Base-emitter voltage $I_C = 2.0\text{mA}$, $V_{CE} = 5.0\text{V}$	550	620	700	mV
	$I_C = 10\text{mA}$, $V_{CE} = 5.0\text{V}$	-	-	770	mV
$V_{CE(sat)}$	Collector-emitter saturation voltage $I_C = 10\text{mA}$, $I_B = 0.5\text{mA}$	-	90	250	mV
	$I_C = 100\text{mA}$, $I_B = 5.0\text{mA}$	-	200	600	mV
$V_{BE(sat)}$	†Base-emitter saturation voltage $I_C = 10\text{mA}$, $I_B = 0.5\text{mA}$	-	700	-	mV
	$I_C = 100\text{mA}$, $I_B = 5.0\text{mA}$	-	900	-	mV

* V_{BE} decreases by about $2\text{mV}/^\circ\text{C}$ with increasing temperature.

† $V_{BE(sat)}$ decreases by about $1.7\text{mV}/^\circ\text{C}$ with increasing temperature.

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ELECTRICAL CHARACTERISTICS (contd.)

Min. Typ. Max.

V_{CEK}	Collector knee voltage (see Fig. 1)			
	$I_C = 10\text{mA}$, I_B = the value for which			
	$I_C = 11\text{mA}$ at $V_{CE} = 1.0\text{V}$			
	-	300	600	mV

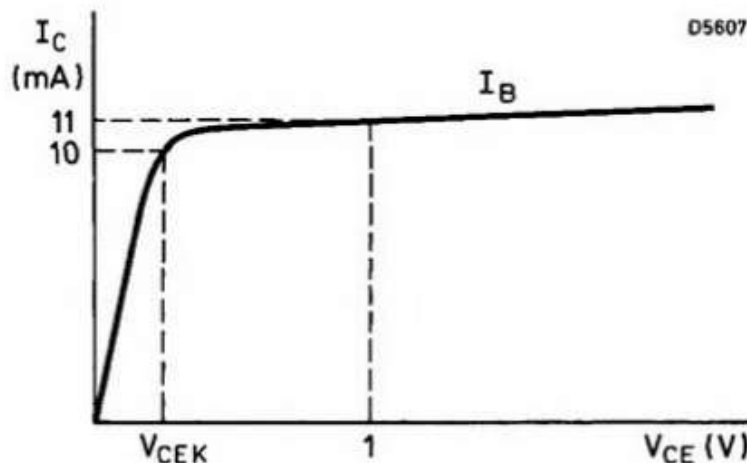


Fig. 1

h_{FE}	Static forward current transfer ratio				
	$I_C = 2.0\text{mA}$, $V_{CE} = 5.0\text{V}$	BC147	110	-	450
		BC148	110	-	800
		BC149	200	-	800
h_{fe}	Small signal forward current transfer ratio				
	$I_C = 2.0\text{mA}$, $V_{CE} = 5.0\text{V}$, $f = 1.0\text{kHz}$	BC147	125	-	500
		BC148	125	-	900
		BC149	240	-	900
f_T	Transition frequency				
	$I_C = 10\text{mA}$, $V_{CE} = 5.0\text{V}$, $f = 35\text{MHz}$	-	300	-	MHz
C_{Tc}	Collector capacitance				
	$I_E = I_c = 0$, $V_{CB} = 10\text{V}$, $f = 1.0\text{MHz}$	-	2.5	4.5	pF
C_{Te}	Emitter capacitance				
	$I_C = I_c = 0$, $V_{EB} = 0.5\text{V}$, $f = 1.0\text{MHz}$	-	9.0	-	pF
N	Noise figure				
	$I_C = 0.2\text{mA}$, $V_{CE} = 5.0\text{V}$, $R_S = 2.0\text{k}\Omega$				
	$f = 30\text{Hz}$ to 15kHz	BC149	-	1.4	4.0 dB
	$f = 1.0\text{kHz}$, $B = 200\text{Hz}$	BC147/148	-	2.0	10 dB
		BC149	-	1.2	4.0 dB

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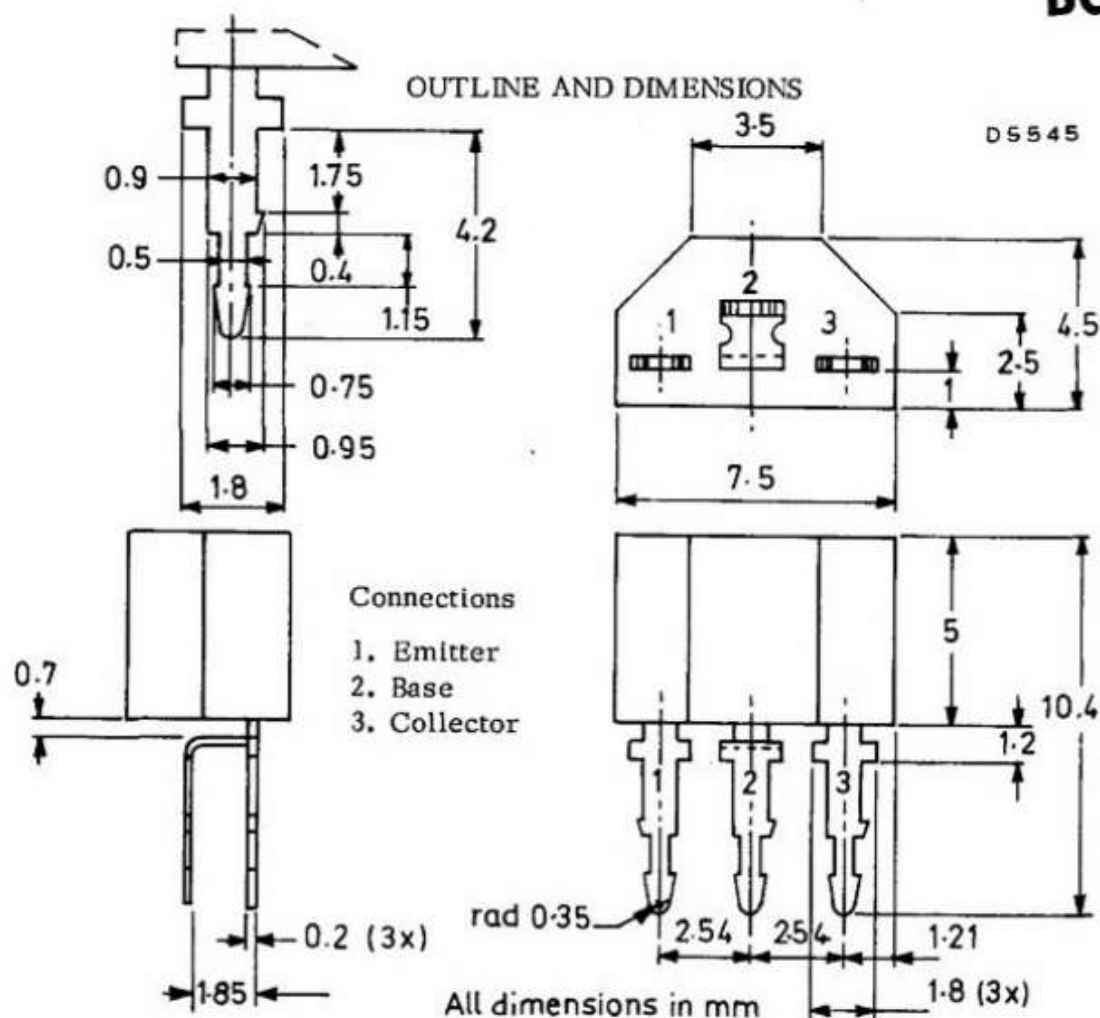
ELECTRICAL CHARACTERISTICS (contd.)

The following supplementary gain groups are available on request: -

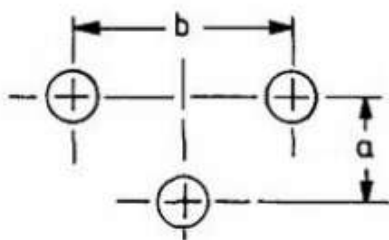
		BC147A BC148A		BC147B BC148B BC149B	BC148C BC149C		
h_{FE}	Static forward current transfer ratio						
	$I_C = 10\mu A, V_{CE} = 5.0V$	min.	-	40	100		
		typ.	90	150	270		
	$I_C = 2.0mA, V_{CE} = 5.0V$	min.	110	200	420		
		typ.	180	290	520		
		max.	220	450	800		
h parameters							
	$I_C = 2.0mA, V_{CE} = 5.0V, f = 1.0kHz$						
h_{ie}	Input impedance	min.	1.6	3.2	6.0	k Ω	
		typ.	2.7	4.5	8.7	k Ω	
		max.	4.5	8.5	15	k Ω	
h_{re}	Voltage feedback ratio	typ.	1.5	2.0	3.0	$\times 10^{-4}$	
h_{fe}	Small signal current gain	min.	125	240	450		
		typ.	220	330	600		
		max.	260	500	900		
h_{oe}	Output admittance	typ.	18	30	60	$\mu A/V$	
		max.	30	60	110	$\mu A/V$	

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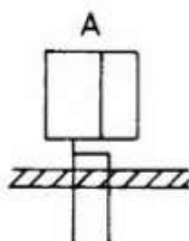
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Mounting details

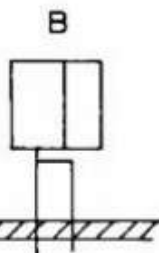


$a = 2.49 \text{ to } 2.59 \text{ mm}$
 $b = 5.03 \text{ to } 5.13 \text{ mm}$



Maximum thickness of
printed board = 1.7 mm

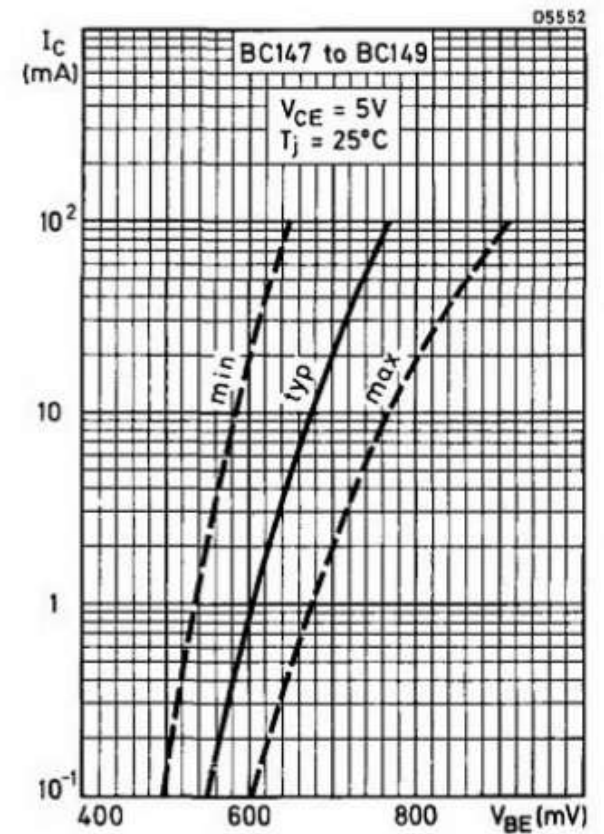
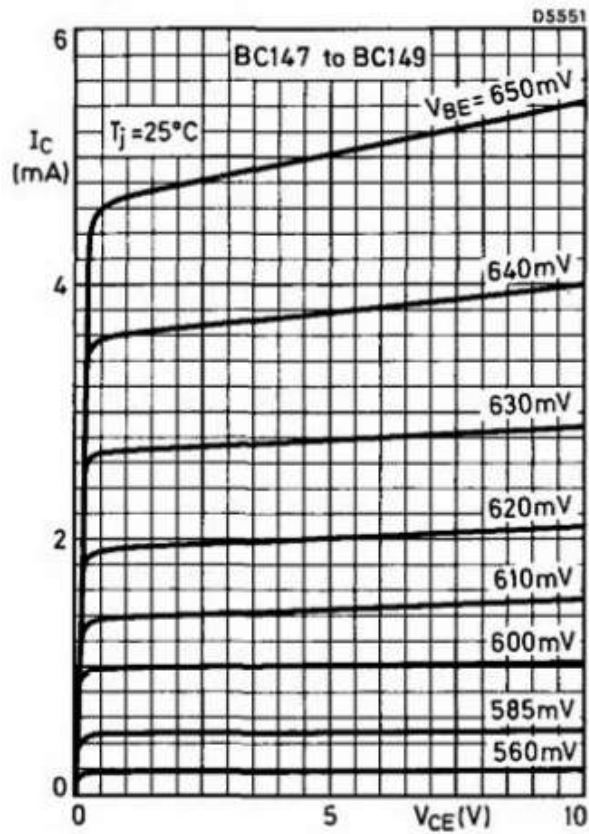
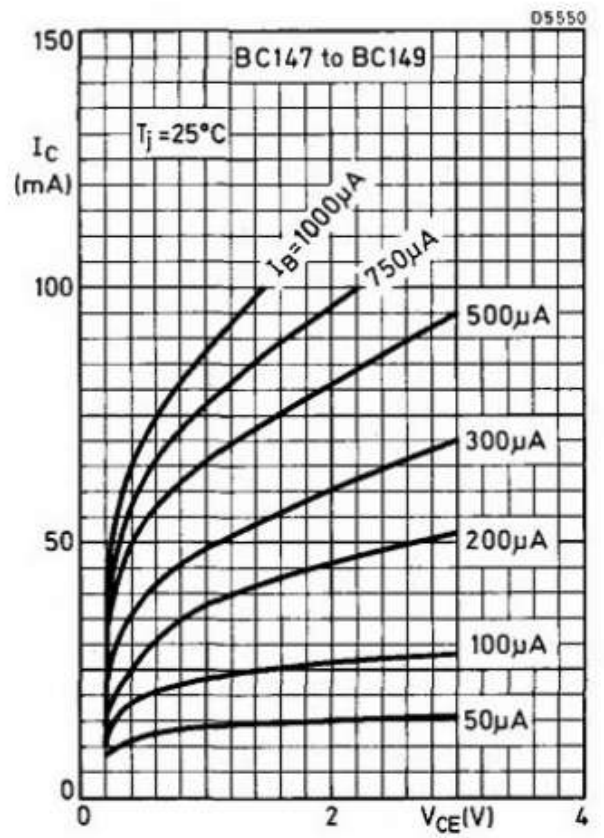
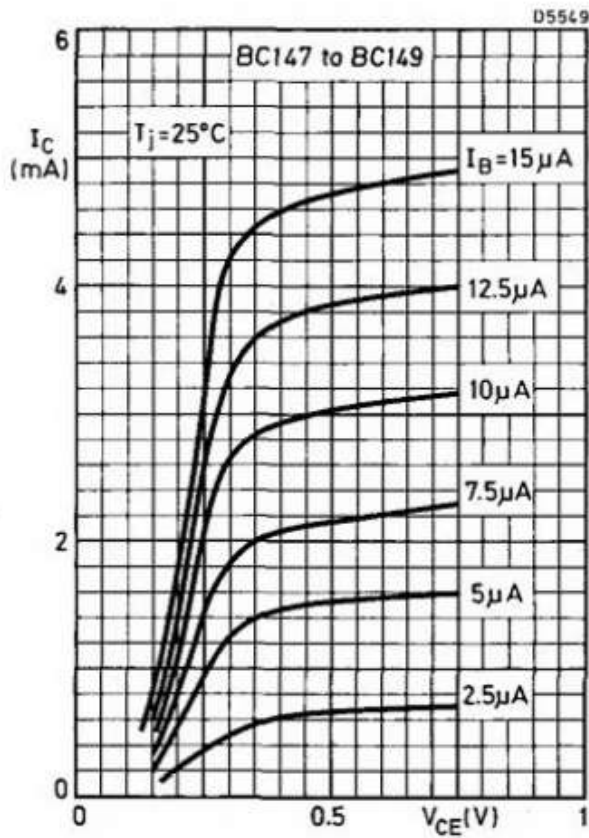
Recommended hole
diameter = 1.0 to 1.1 mm
(1.0 to 1.3 mm allowable)



Maximum thickness of
printed board = 1.1 mm
Hole diameter = 0.77 to 0.83 mm

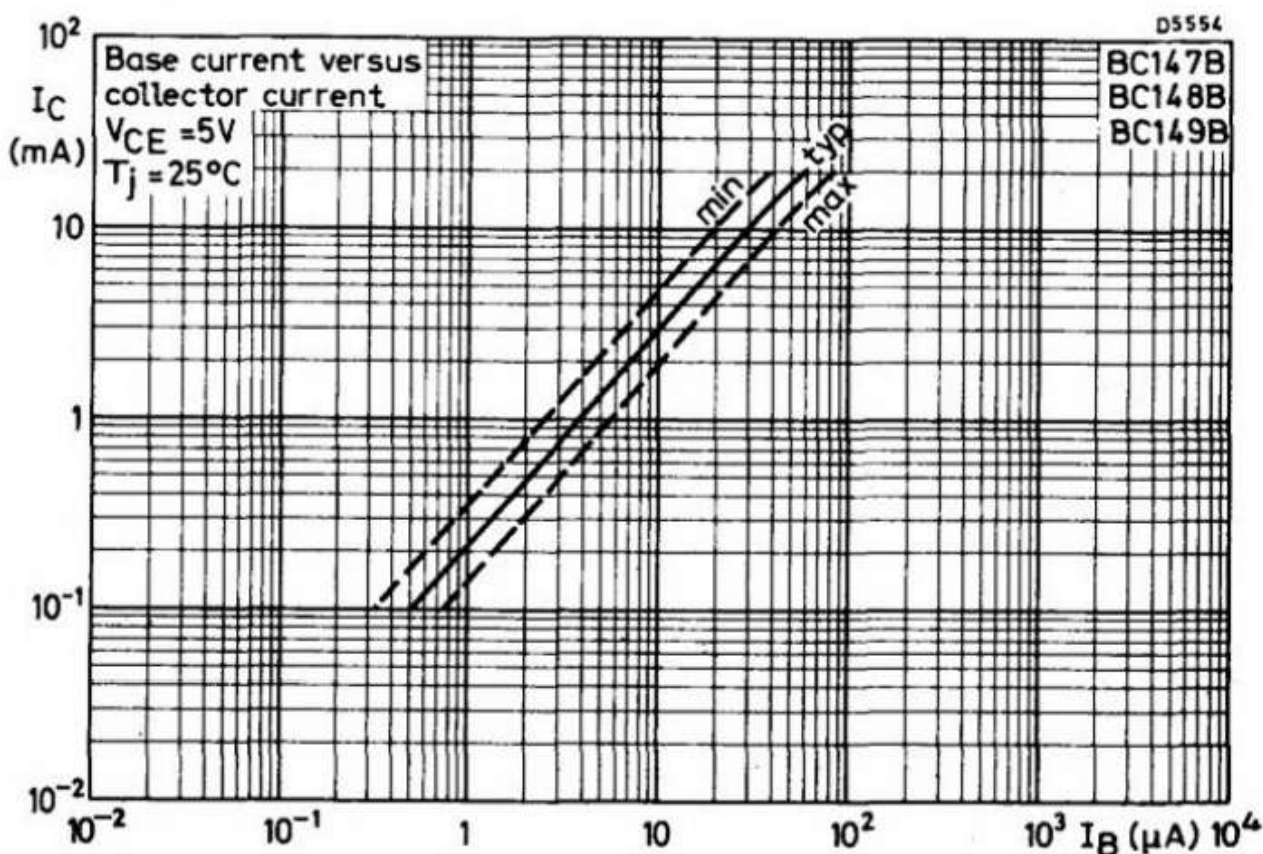
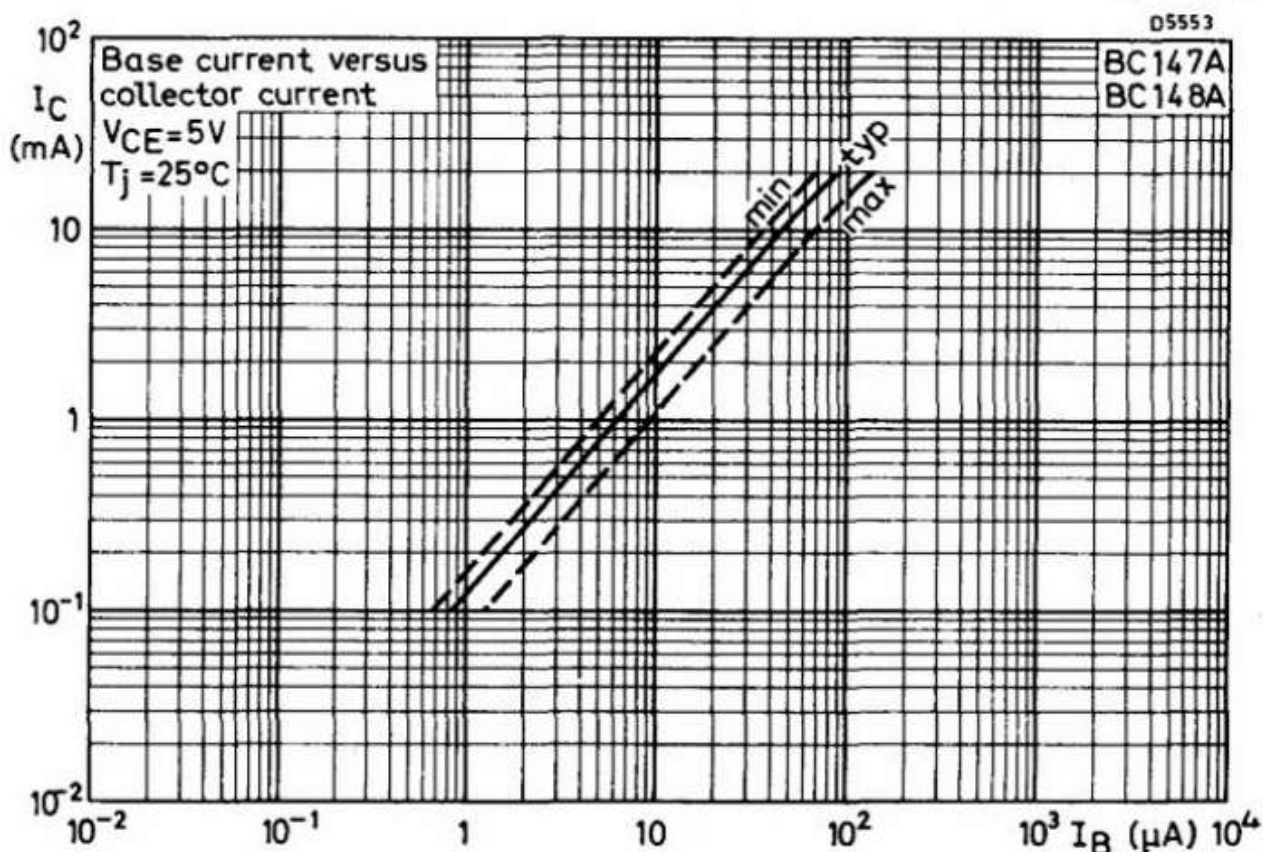
See also General Explanatory Notes Section IV.

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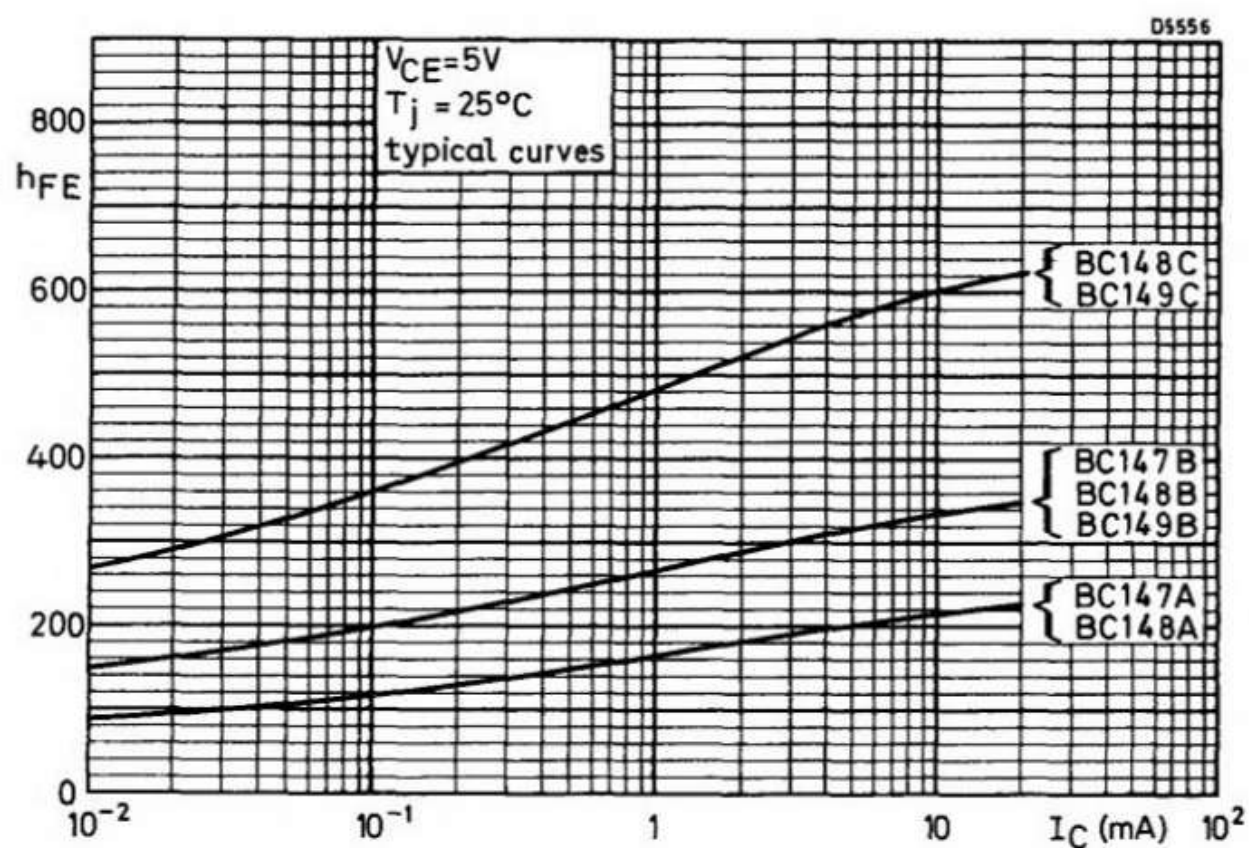
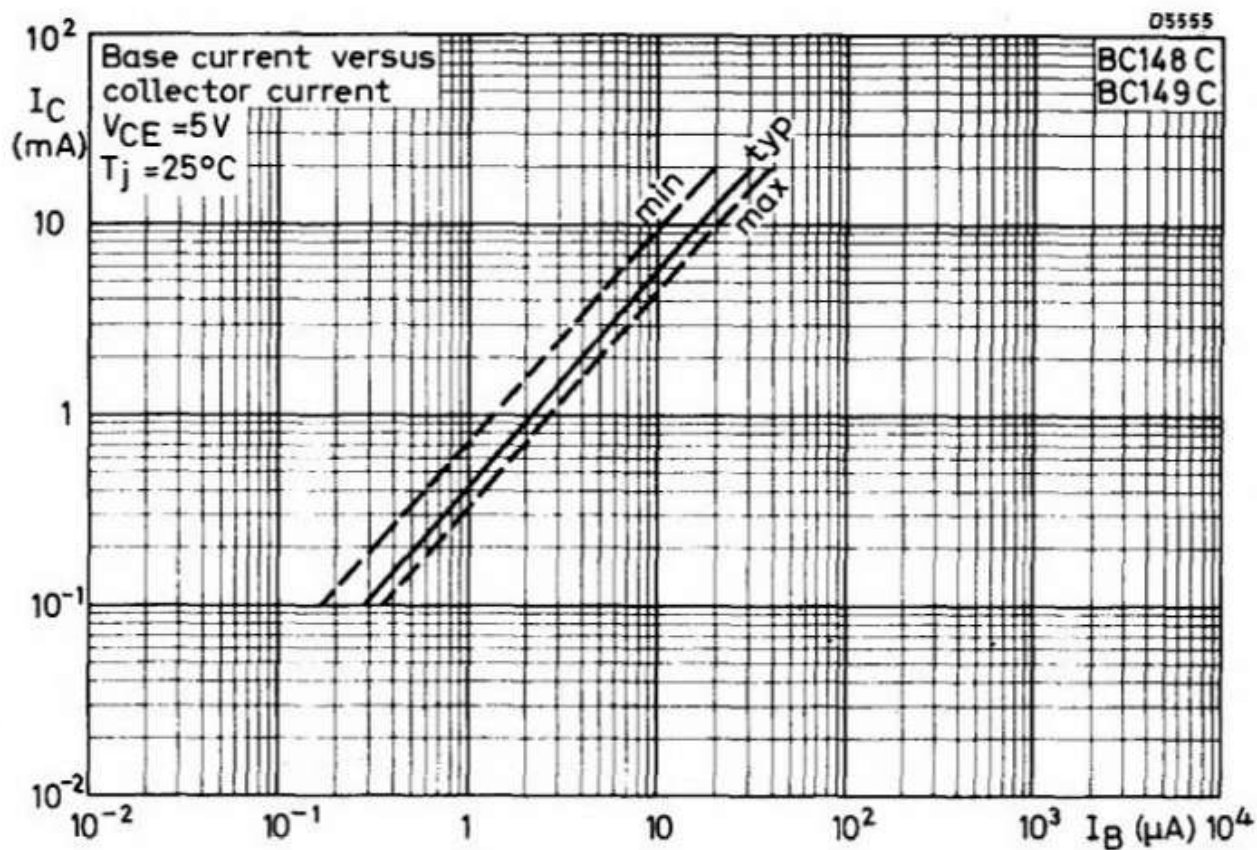


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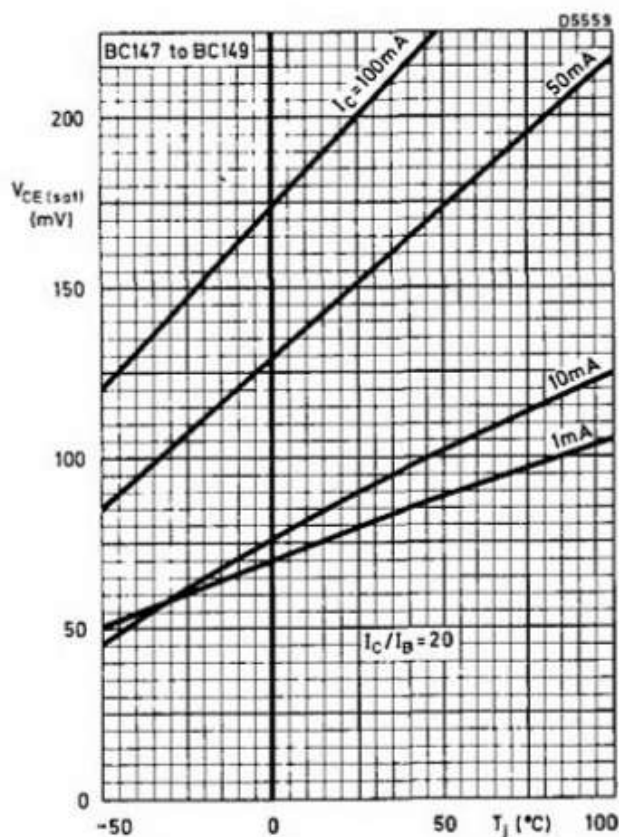
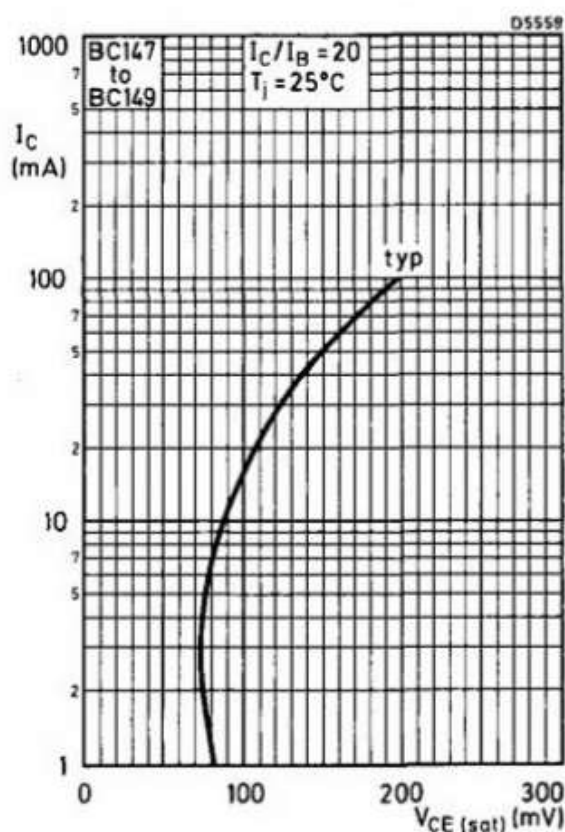
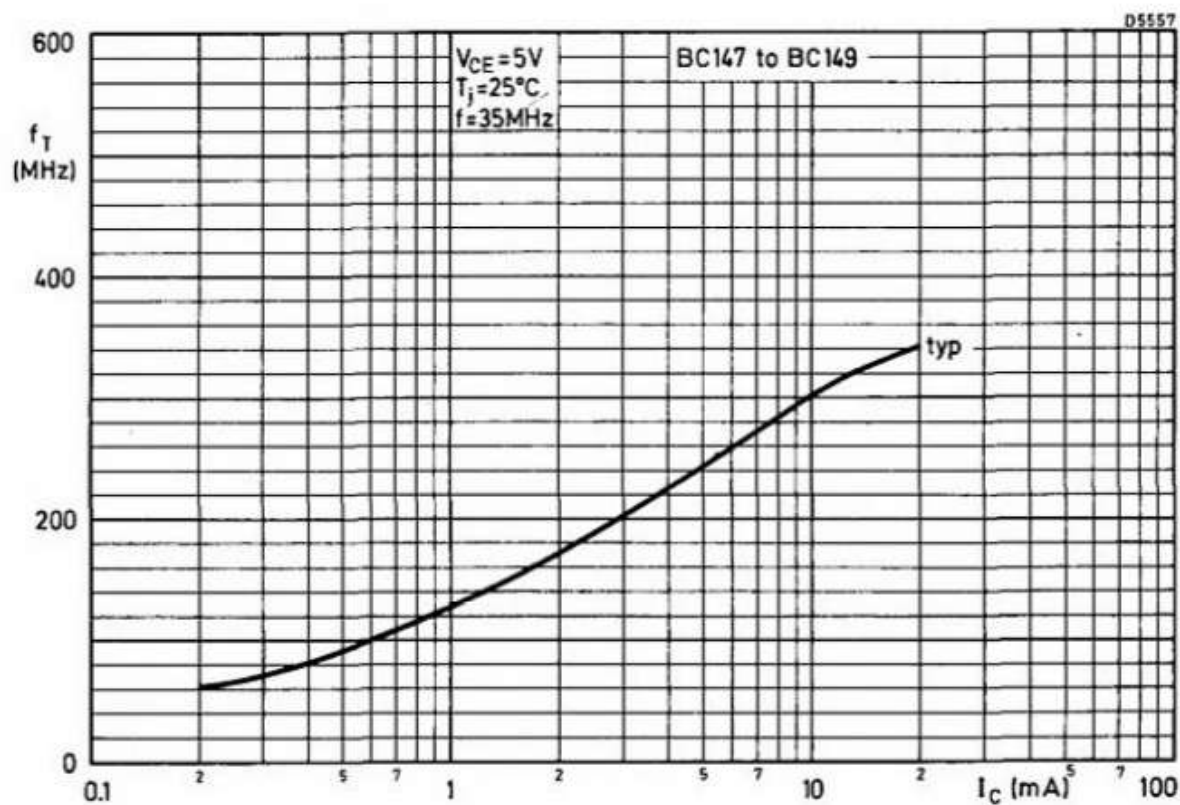


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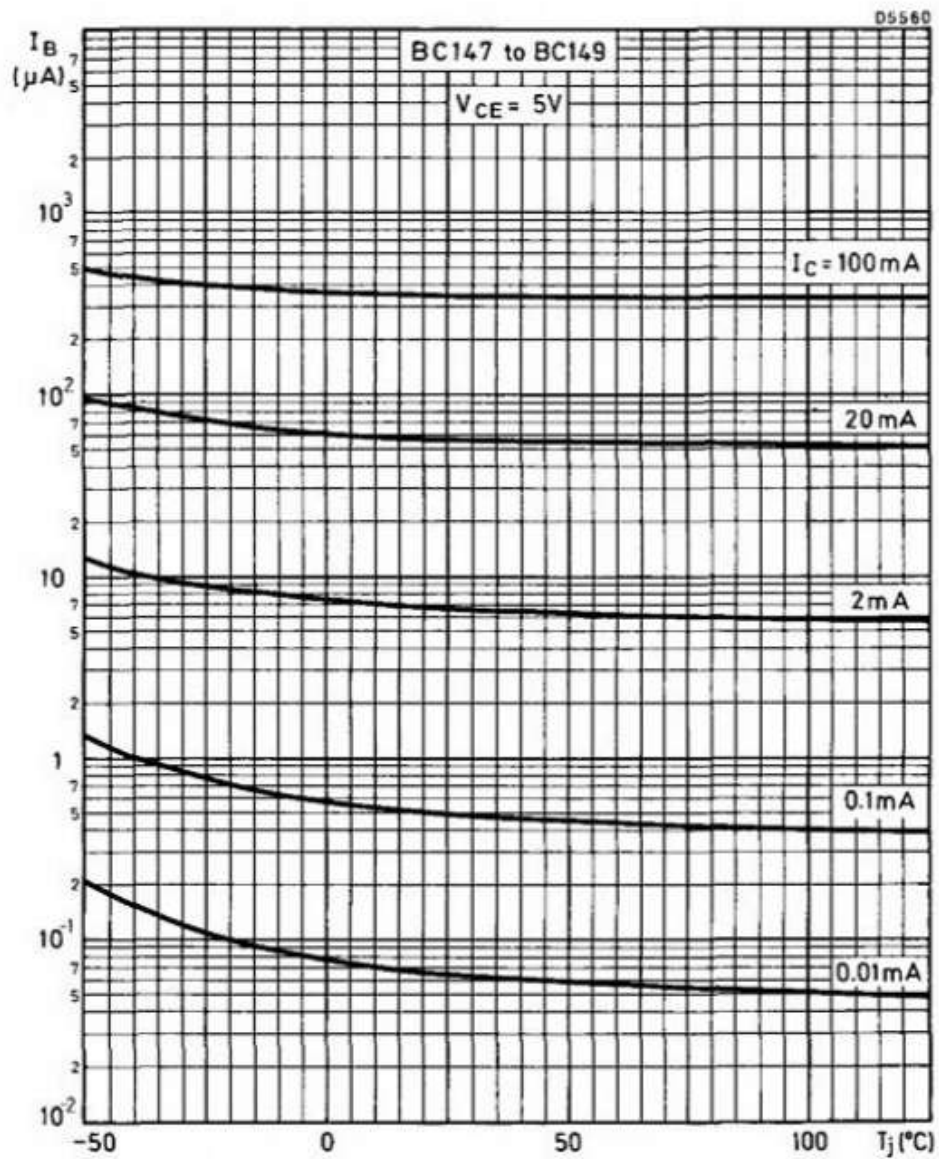


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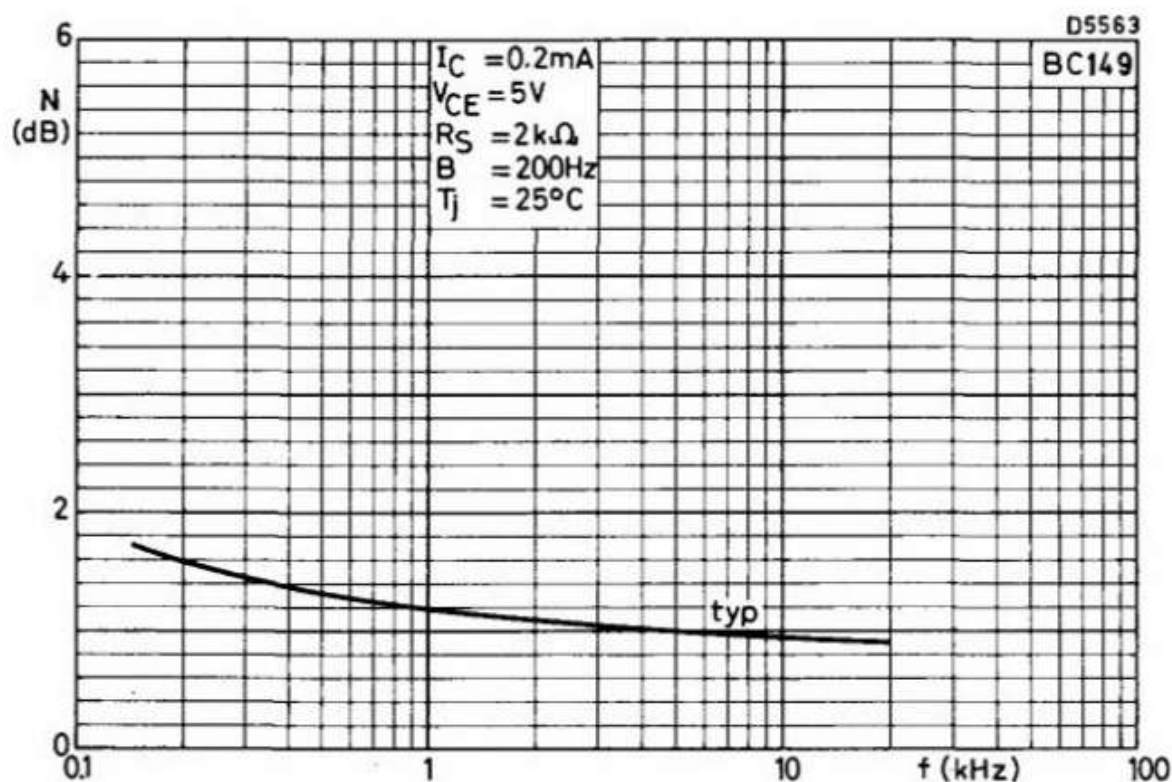
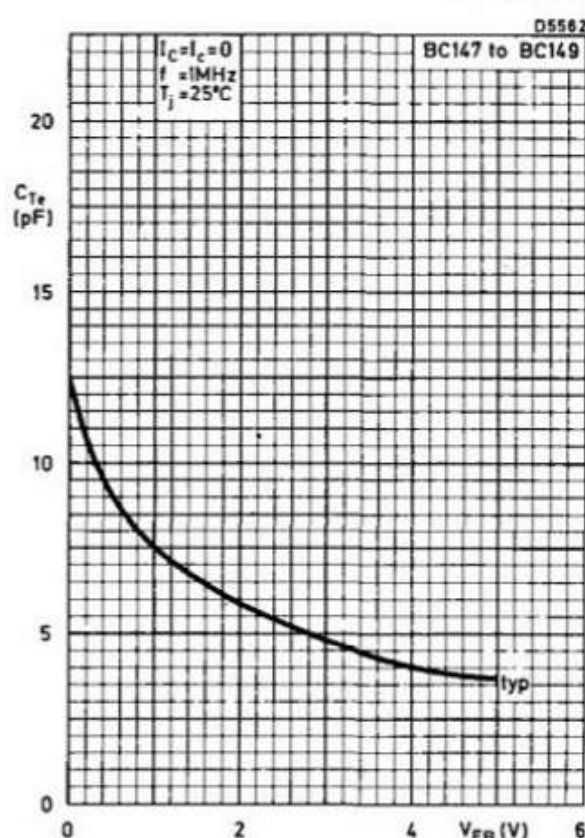
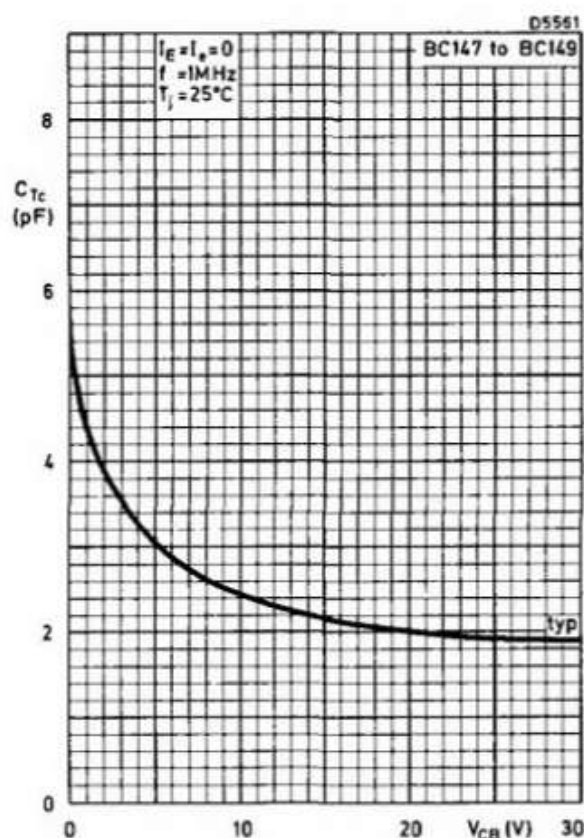


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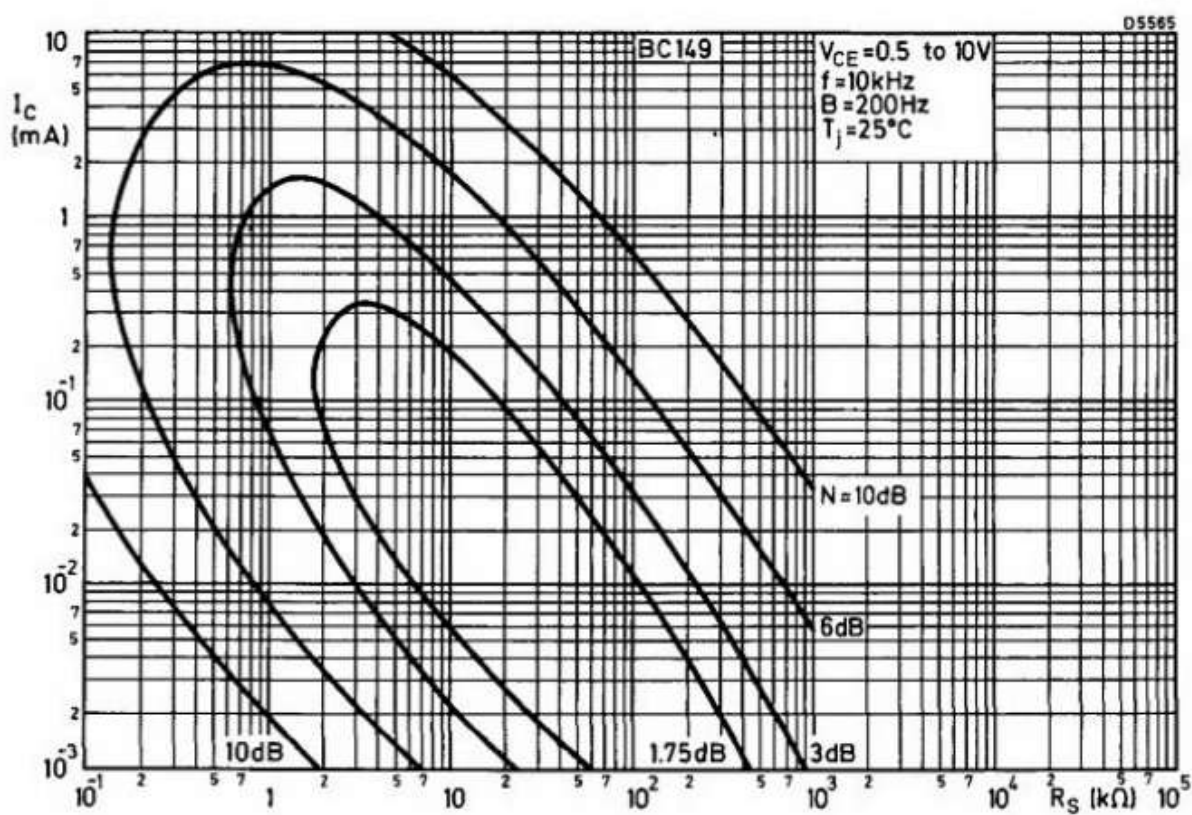
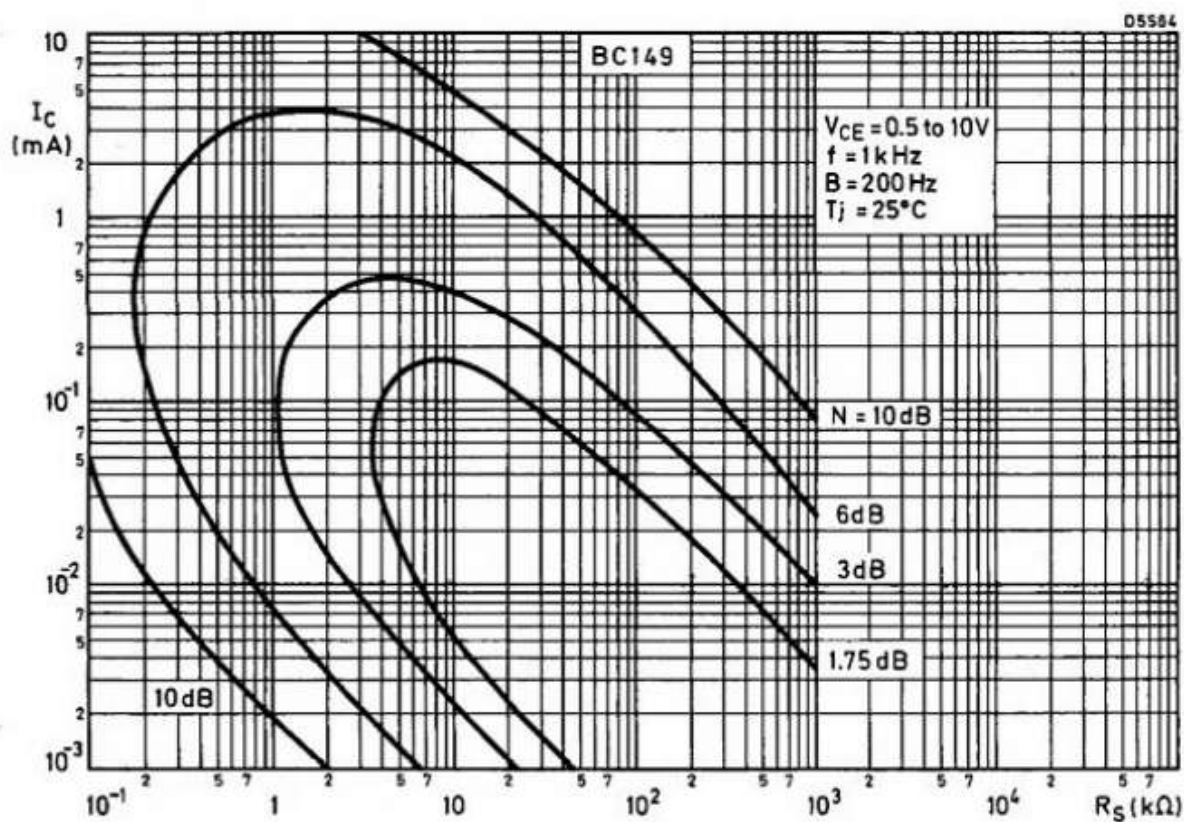


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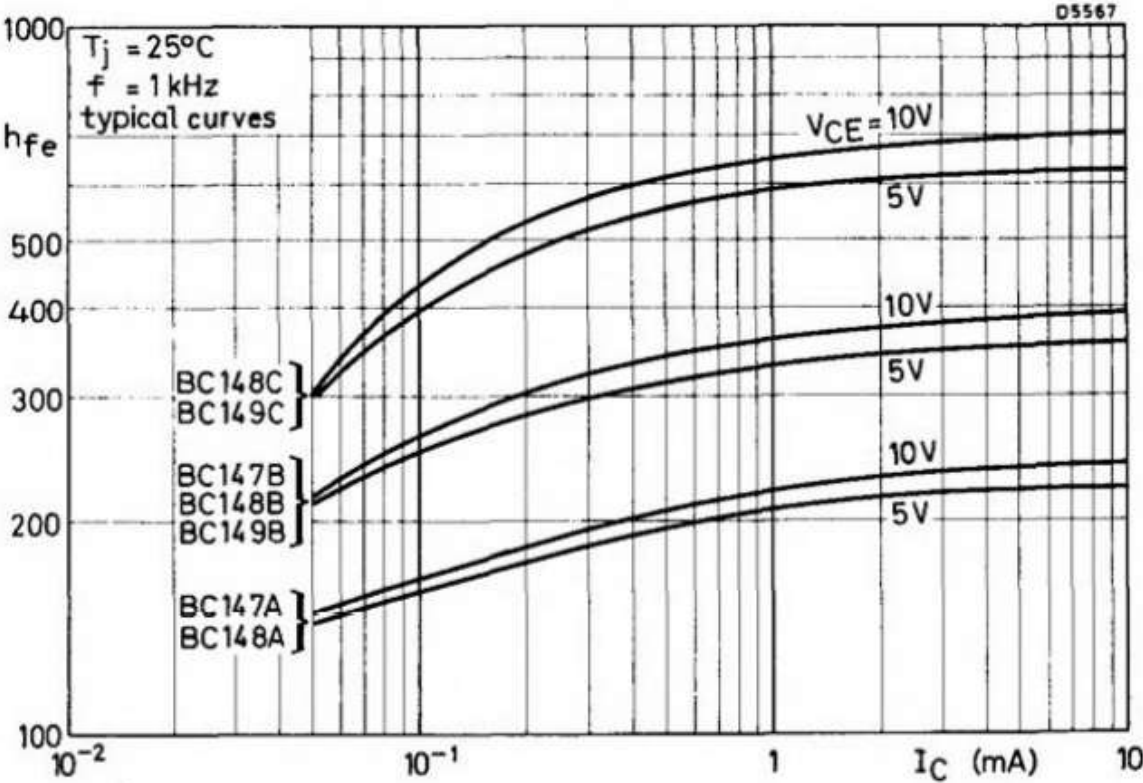
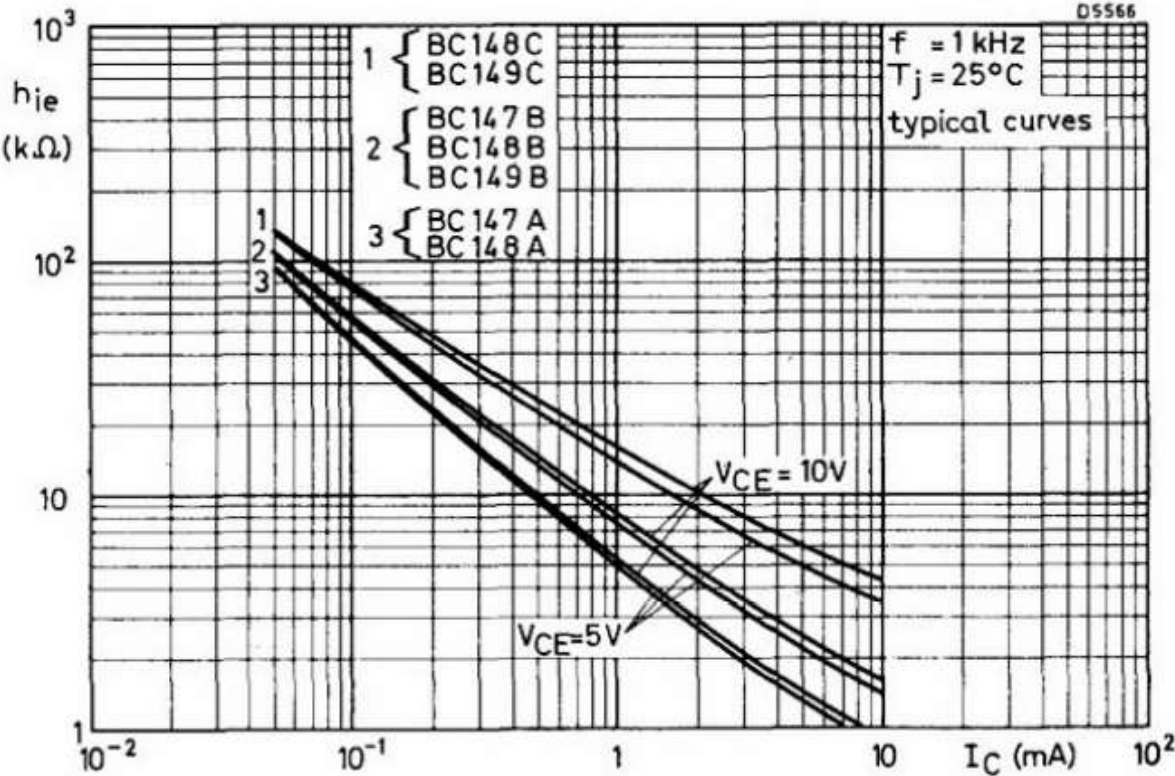
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TYPICAL CURVES OF CONSTANT NOISE FIGURE

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