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.

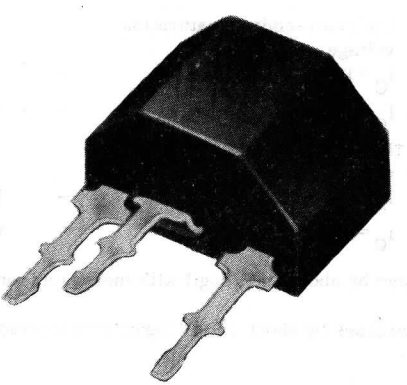
QUICK REFERENCE DATA

		BC147	BC148	BC149		
V_{CES} max.		50	30	30		V
V_{CEO} max.		45	20	20		V
I_{CM} max.					200	mA
P_{tot} max. ($T_{amb} \leq 25^{o}C$)					220	mW
T_j max.					125	^{o}C
h_{fe} ($I_C = 2mA$, $V_{CE} = 5V$, f = 1kHz)		125-500	125-500	240-900		
f_T typ. ($I_C = 10mA$, $V_{CE} = 5V$)					300	MHz
N ($I_C = 200\mu A$, $V_{CE} = 5V$, $R_s = 2k\Omega$)						
f = 30Hz to 15kHz	typ.	-	-	1.8		dB
	max.	-	-	4.0		dB
f = 1kHz, B = 200Hz	typ.	2.0	2.0	-		dB

Unless otherwise stated data is applicable to all types

OUTLINE AND DIMENSIONS

For details see page 5.



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	mA
I_{CM} max.			200	mA
$-I_{EM}$ max.			200	mA
I_{BM} max.			200	mA
P_{tot} max. ($T_{amb} \leq 25^oC$)			220	mW

Temperature

T_{stg} min.	-65	^oC
T_{stg} max.	125	^oC
T_j max.	125	^oC

THERMAL CHARACTERISTIC

$R_{th(j-amb)}$	0.45	degC/mW

ELECTRICAL CHARACTERISTICS ($T_j = 25^oC$ unless otherwise stated)

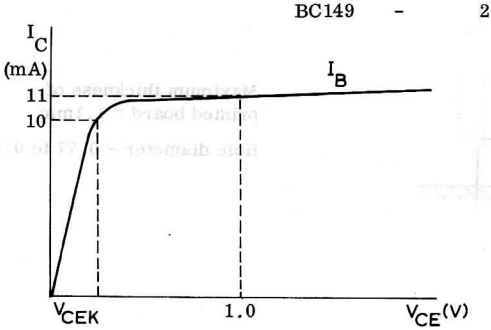
		Min.	Typ.	Max.	
I_{CBO}	Collector cut-off current $V_{CB}=20V$, $I_E=0$, $T_j=125^oC$	-	-	5.0	μA
V_{BE}	*Base-emitter voltage $I_C=2.0mA$, $V_{CE}=5.0V$	550	620	700	mV
	$I_C=10mA$, $V_{CE}=5.0V$	-	-	770	mV
$V_{CE(sat)}$	Collector-emitter saturation voltage $I_C=10mA$, $I_B=0.5mA$	-	90	250	mV
	$I_C=100mA$,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

*V_{BE} decreases by about 2mV/degC with increasing temperature.

†$V_{BE(sat)}$ decreases by about 1.7mV/degC with increasing temperature

ELECTRICAL CHARACTERISTICS (cont'd)

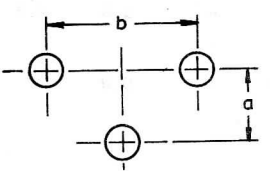
			Min.	Typ.	Max.	
V_{CEK}	Collector knee voltage (see Fig. 1) I_C=10mA, I_B=the value for which I_C=11mA at V_{CE}=1.0V		-	300	600	mV
h_{FE}	Static forward current transfer ratio I_C=10μA, V_{CE}=5.0V	BC147, BC148	-	120	-	
		BC149	-	210	-	
	I_C=2.0mA, V_{CE}=5.0V	BC147, BC148	110	240	450	
		BC149	200	410	800	
f_T	Transition frequency I_C=10mA, V_{CE}=5.0V		-	300	-	MHz
C_{tc}	Collector capacitance I_E=I_e=0, V_{CB}=10V, f=1.0MHz		-	2.5	4.5	pF
C_{te}	Emitter capacitance I_C=I_c=0, V_{EB}=0.5V, f=1.0MHz		-	9.0	-	pF
N	Noise figure I_C=200μA, V_{CE}=5.0V, R_s=2.0kΩ f=30Hz to 15kHz	BC149	-	1.8	4.0	dB
	f=1.0kHz, B=200Hz	BC147, BC148	-	2.0	10	dB
		BC149	-	2.0	4.0	dB



ELECTRICAL CHARACTERISTICS (cont'd)

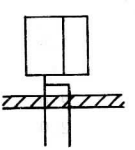
			Min.	Typ.	Max.	
h-parameters (common emitter)						
Measured at I_C=2.0mA, V_{CE}=5.0V, f=1.0kHz						
h_{ie}	Input impedance	BC147, BC148	1.6	3.6	8.5	kΩ
		BC149	3.2	6.5	15	kΩ
h_{re}	Voltage feedback ratio					
		BC147, BC148	-	1.8	-	$\times 10^{-4}$
		BC149	-	2.5	-	$\times 10^{-4}$
h_{fe}	Small signal forward current transfer ratio					
		BC147, BC148	125	280	500	
		BC149	240	460	900	
h_{oe}	Output admittance					
		BC147, BC148	-	24	60	μmho
		BC149	-	45	110	μmho

MOUNTING INSTRUCTIONS



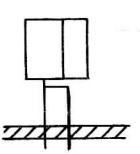
a = 2.49 to 2.59mm

b = 5.03 to 5.13mm



Maximum thickness of printed board = 1.7mm

Hole diameter = 1.25 to 1.35mm



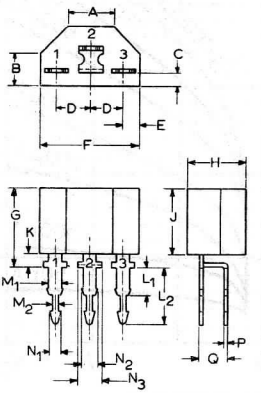
Maximum thickness of printed board = 1.1mm

Hole diameter = 0.77 to 0.83mm

N-P-N SILICON PLANAR EPITAXIAL TRANSISTORS

BC147
BC148
BC149

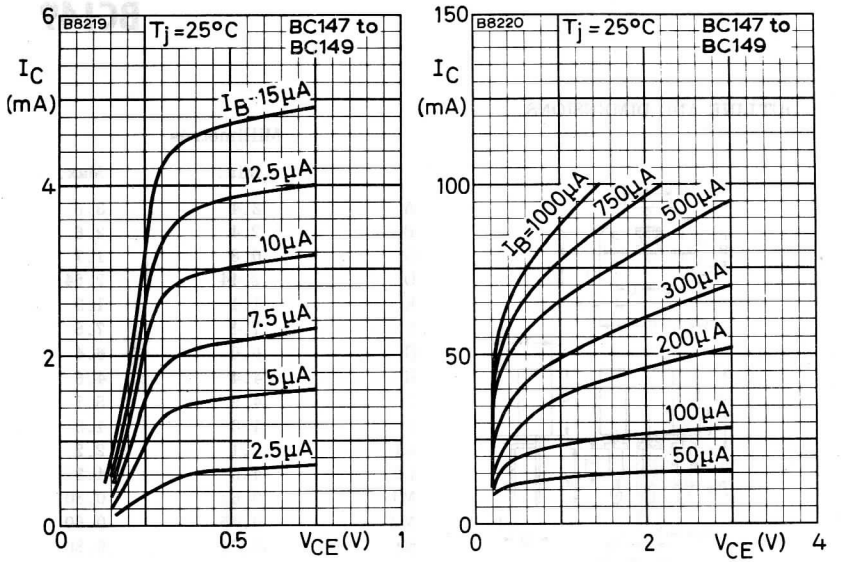
OUTLINE AND DIMENSIONS



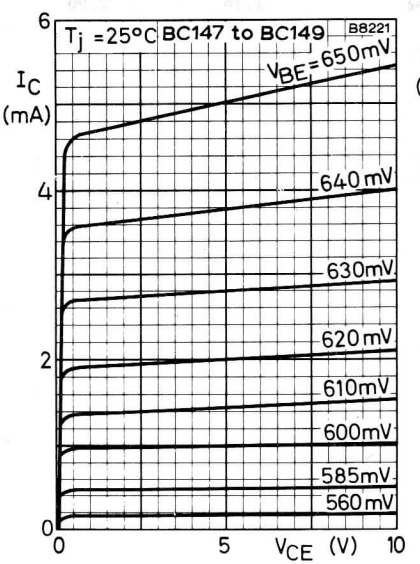
	Millimetres	
	Min.	Max.
A	3.4	3.6
B	2.4	2.6
C	0.8	1.1
D	2.44	2.64
E	1.1	1.3
F	7.4	7.6
G	6.0	6.4
H	4.4	4.6
J	4.9	5.1
K	1.0	1.3
L1	2.1	2.2
L2	4.0	4.3
M1	0.65	0.80
M2	0.45	0.60
N1	0.70	0.80
N2	1.15	1.25
N3	1.75	2.00
P	0.17	0.25
Q	1.75	2.00

Pin connections

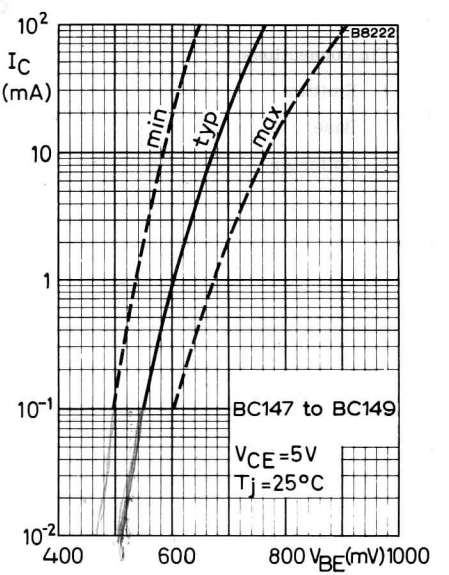
1. Emitter
2. Base
3. Collector



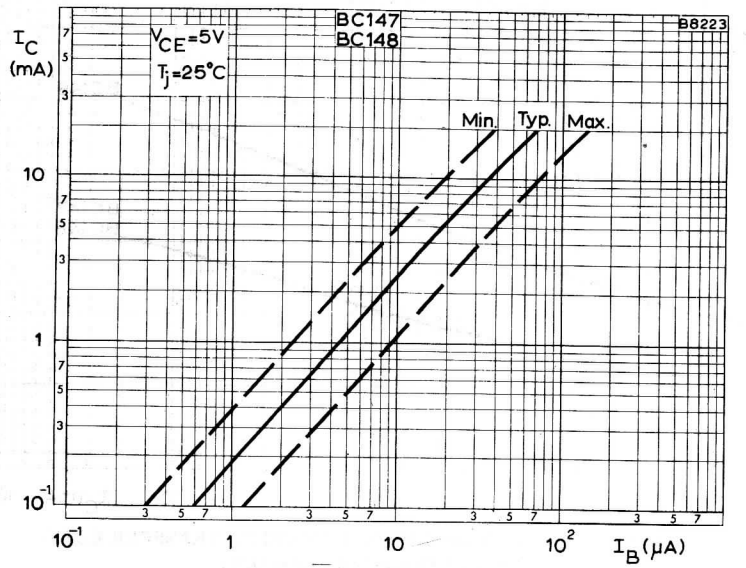
TYPICAL OUTPUT CHARACTERISTICS

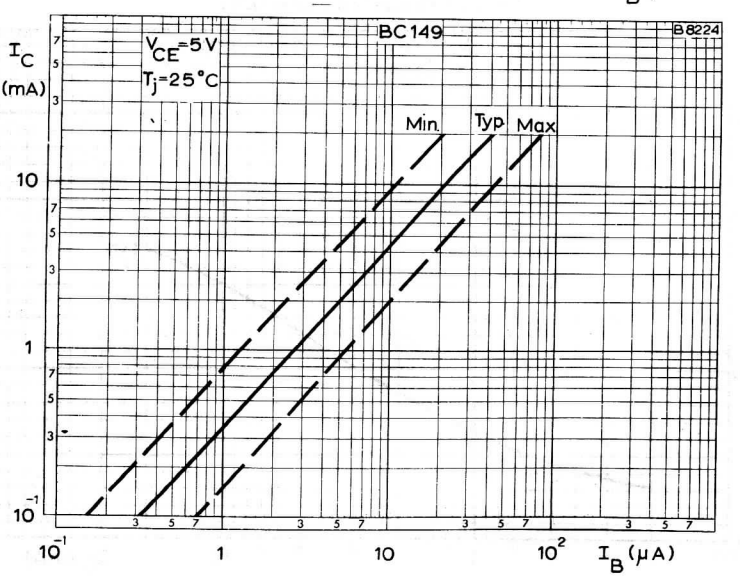


Typical output characteristic

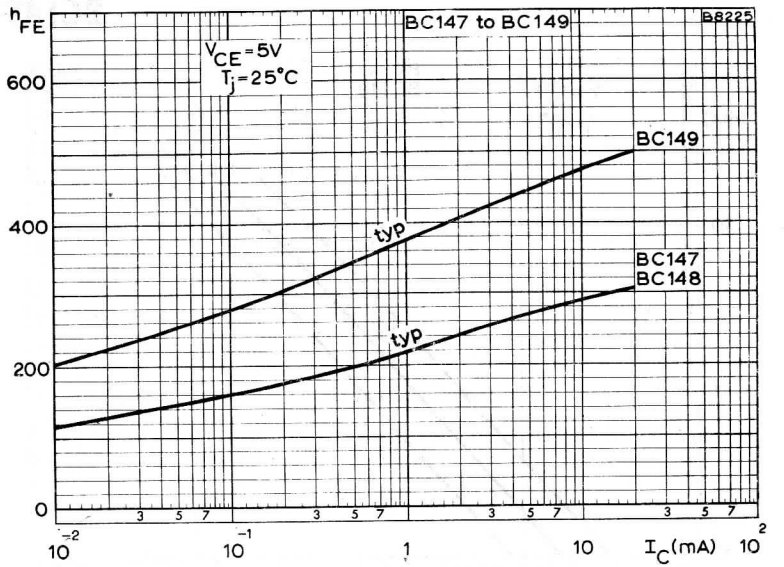


Spread of mutual characteristics

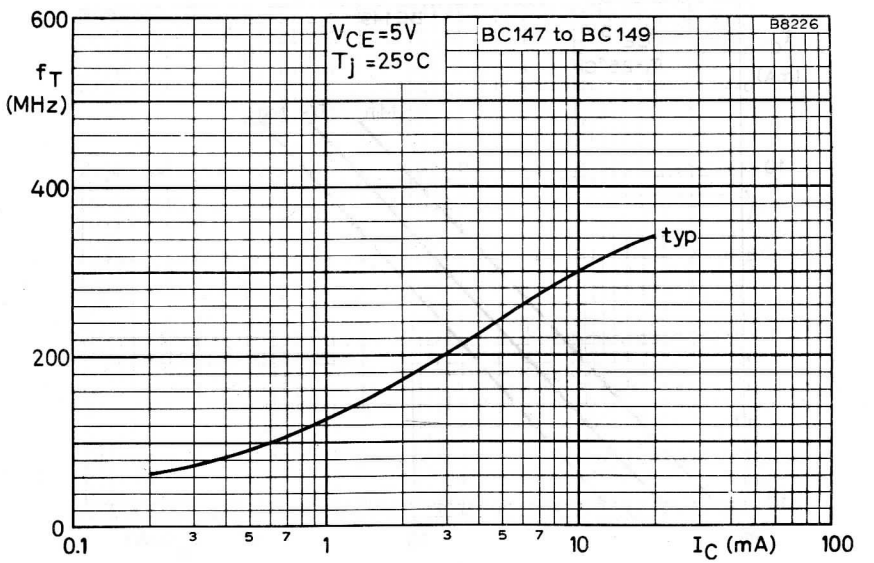




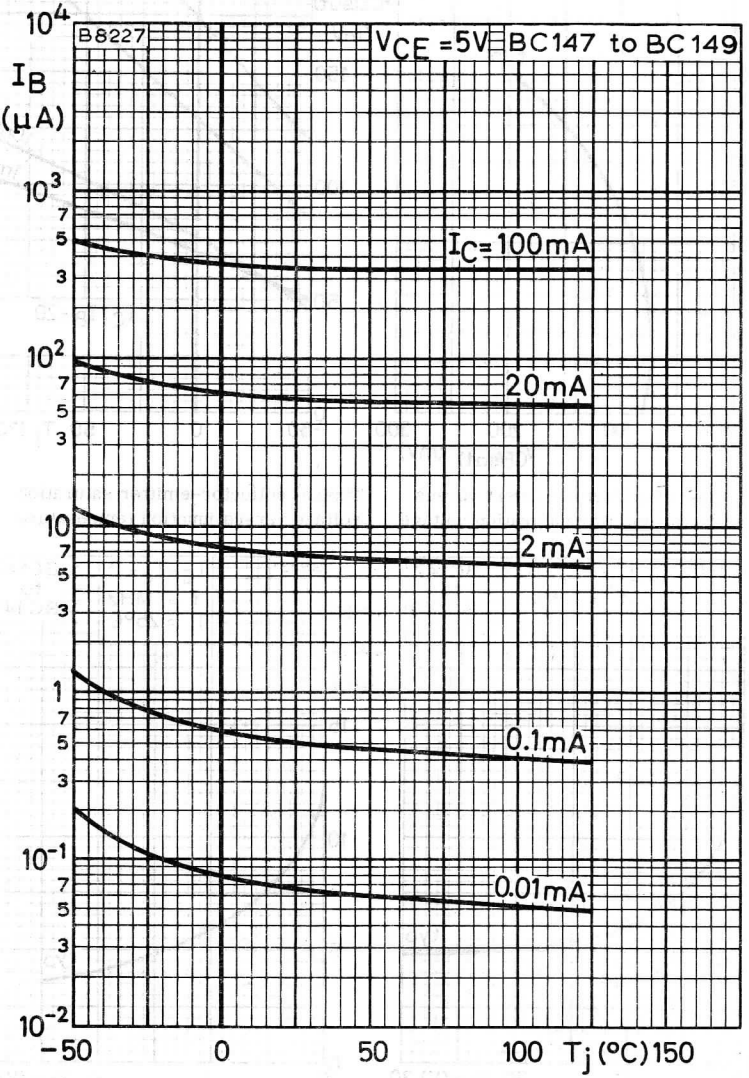
SPREAD OF TRANSFER CHARACTERISTIC



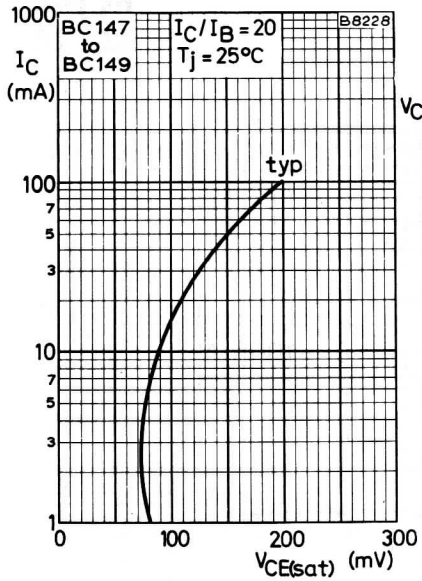
TYPICAL VARIATION OF FORWARD CURRENT TRANSFER RATIO WITH COLLECTOR CURRENT



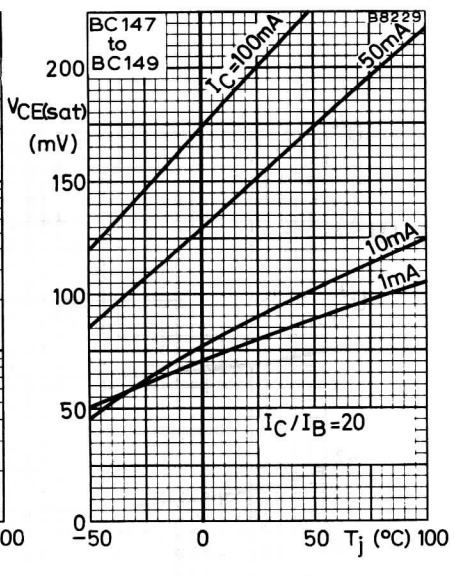
TYPICAL VARIATION OF TRANSITION FREQUENCY WITH COLLECTOR CURRENT



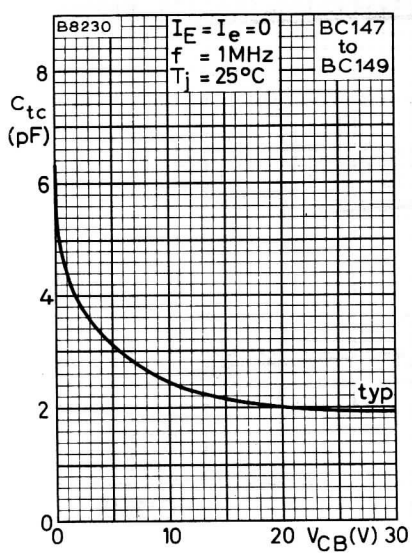
TYPICAL VARIATION OF BASE CURRENT WITH JUNCTION TEMPERATURE



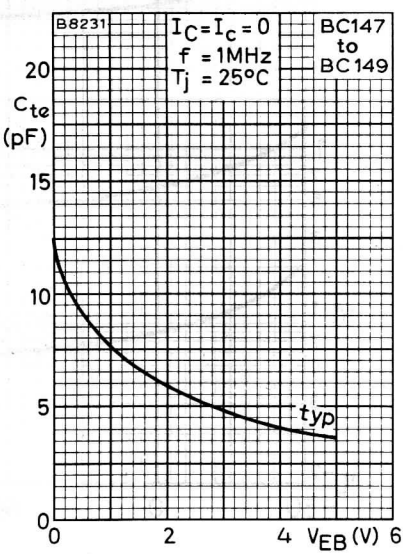
Typical collector current versus collector-emitter saturation voltage



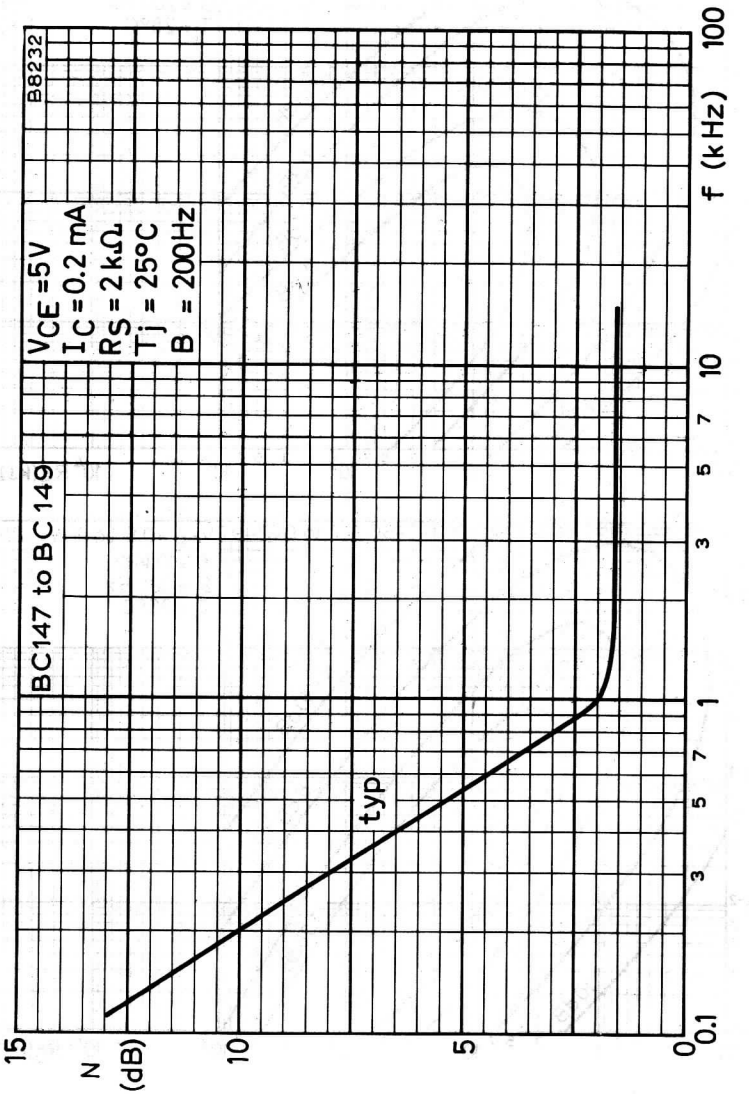
Typical collector-emitter saturation voltage versus junction temperature



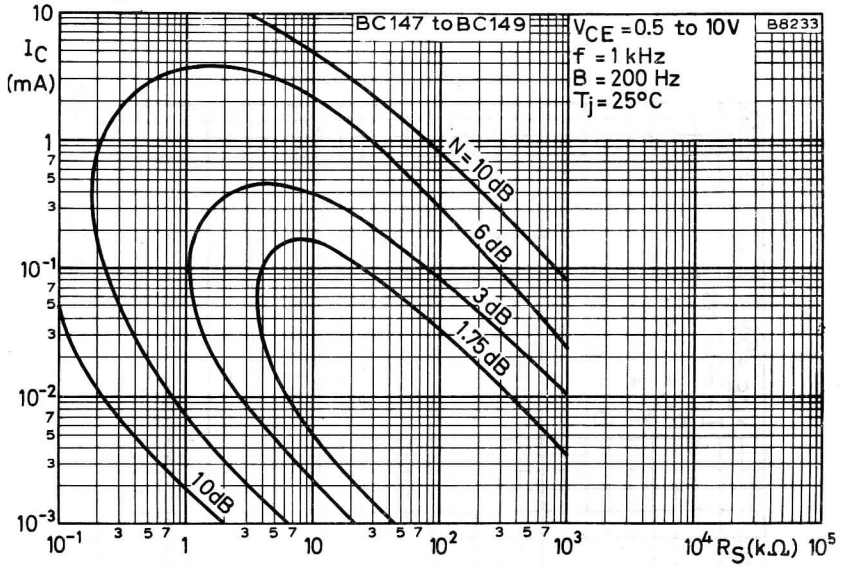
Typical collector capacitance versus collector-base voltage

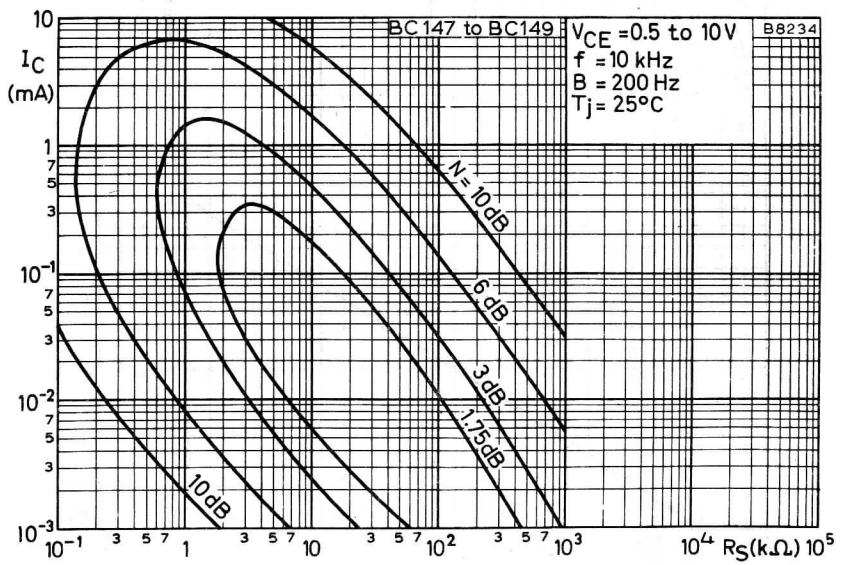


Typical emitter capacitance versus emitter-base voltage

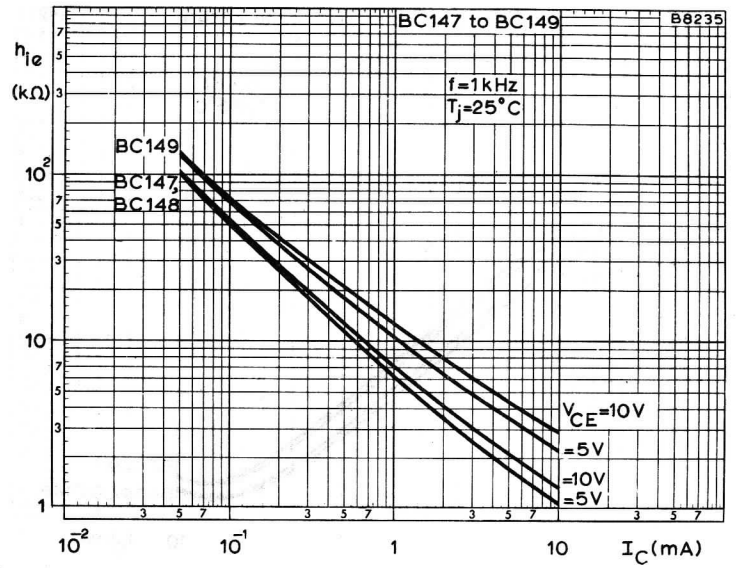


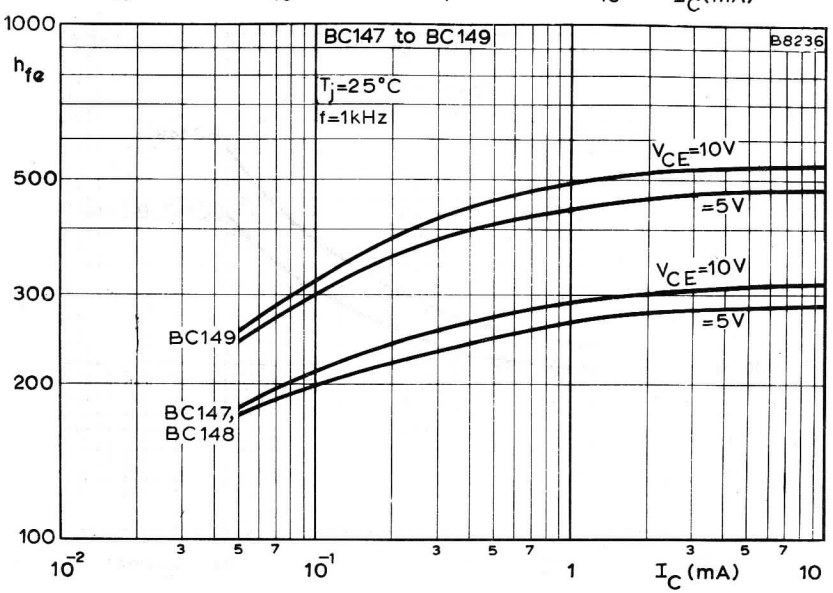
TYPICAL VARIATION OF NOISE FIGURE WITH FREQUENCY



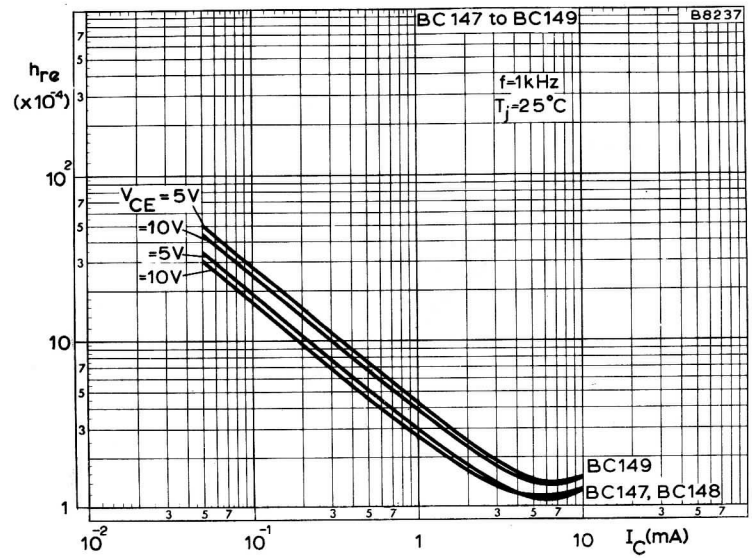


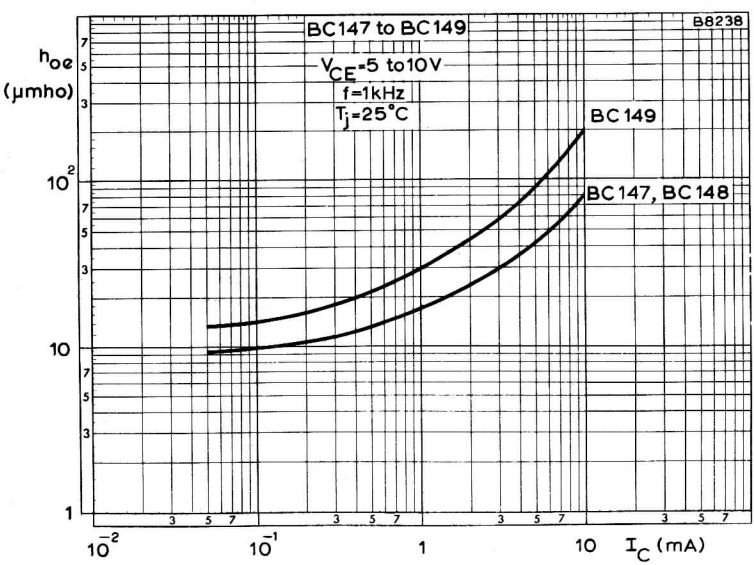
TYPICAL CURVES OF CONSTANT NOISE FIGURE





TYPICAL VARIATION OF INPUT IMPEDANCE AND SMALL SIGNAL FORWARD CURRENT TRANSFER RATIO WITH COLLECTOR CURRENT





TYPICAL VARIATION OF VOLTAGE FEEDBACK RATIO AND OUTPUT ADMITTANCE WITH COLLECTOR CURRENT