

## NPN Silicon Transistors

SIEMENS AKTIENGESELLSCHAFT

BD 135

BD 137

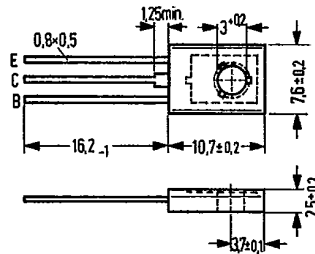
BD 139

## For AF driver and output stages of medium performance

BD 135, BD 137, and BD 139 are epitaxial NPN silicon planar transistors in TO 126 plastic package (12 A 3 DIN 41869, sheet 4). The collector is electrically connected to the metallic mounting area. Together with BD 136, BD 138, and BD 140 as complementary pairs the transistors BD 135, BD 137, and BD 139 are designed for use in driver stages of high performance AF amplifiers.

Type	Ordering code
BD 135	Q62702-D106
BD 135-6	Q62702-D106-V1
BD 135-10	Q62702-D106-V2
BD 135-16	Q62702-D106-V3
BD 135 paired	Q62702-D106-P
BD 137	Q62702-D108
BD 137-6	Q62702-D108-V1
BD 137-10	Q62702-D108-V2
BD 137 paired	Q62702-D108-P
BD 139	Q62702-D110
BD 139-6	Q62702-D110-V1
BD 139-10	Q62702-D110-V2
BD 139 paired	Q62702-D110-P
BD 135/BD 136 compl. pair.	Q62702-D139-S1
BD 137/BD 138 compl. pair.	Q62702-D140-S1
BD 139/BD 140 compl. pair.	Q62702-D141-S1

Type	Ordering code
Mica washer	Q62902-B62
Spring washer	Q62902-B63
A 3 DIN 137	



Approx. weight 0.5 g Dimensions in mm

Transistor fixing with M 3 screw. Starting torque < 0.8 Nm; washer or spring washer should be used.

1) If a 50  $\mu$  mica washer (ungreased) is used, the thermal resistance increases by 8 K/W and in case of a greased one by 4 K/W.

## Maximum ratings

		BD 135	BD 137	BD 139	
Collector-emitter voltage ( $R_{BE} \leq 1 \text{ k}\Omega$ )	$V_{CER}$	—	—	100	V
Collector-base voltage	$V_{CBO}$	45	60	—	V
Collector-emitter voltage	$V_{CEO}$	45	60	80	V
Emitter-base voltage	$V_{EBO}$	5	5	5	V
Collector peak current	$I_{CM}$	2.0	2.0	2.0	A
Collector current	$I_C$	1.5	1.5	1.5	A
Base current	$I_B$	0.2	0.2	0.2	A
Junction temperature	$T_J$	150	150	150	$^{\circ}\text{C}$
Storage temperature range	$T_{stg}$	-55 to +125			$^{\circ}\text{C}$
Total power dissipation ( $T_{case} \leq 25^{\circ}\text{C}$ )	$P_{tot}$	12.5	12.5	12.5	W

## Thermal resistance

Junction to ambient air	$R_{thJA}$	$\leq 110$	$\leq 110$	$\leq 110$	K/W
Junction to case bottom	$R_{thJC}^{1)}$	$\leq 10$	$\leq 10$	$\leq 10$	K/W

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

The transistors BD 135, BD 137, and BD 139 are grouped in accordance with the DC current gain  $h_{FE}$ , and marked by numerals of the German DIN standard.

$h_{FE}$ group	6	10	16	
Type	BD 135 BD 137 BD 139	BD 135 BD 137 BD 139	BD 135 — —	BD 135 BD 137 BD 139
$I_C$ (mA)	$h_{FE}$ $I_C/I_B$	$h_{FE}$ $I_C/I_B$	$h_{FE}$ $I_C/I_B$	$V_{BE}$ (V)
5	> 25	> 25	> 25	—
150	63 (40 to 100)	100 (63 to 160)	160 (100 to 250)	—
500	> 25	> 25	> 25	1.2

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

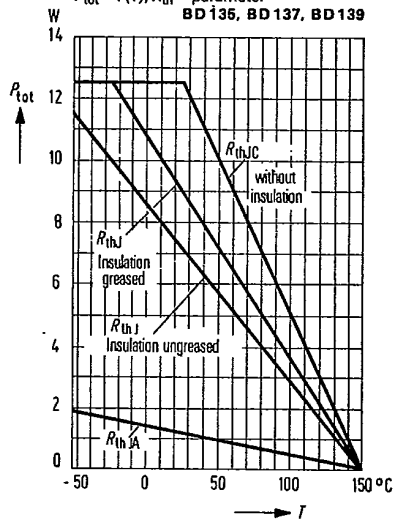
		BD 135	BD 137	BD 139	
Collector-emitter saturation voltage ( $I_C = 500\text{ mA}$ ; $I_B = 50\text{ mA}$ )	$V_{CE\text{sat}}$	< 0.5	< 0.5	< 0.5	V
Collector cutoff current ( $V_{CB} = 30\text{ V}$ )	$I_{CBO}$	< 100	< 100	< 100	nA
Collector cutoff current ( $V_{CB} = 30\text{ V}$ ; $T_{\text{amb}} = 125^\circ\text{C}$ )	$I_{CBO}$	$\leq 10$	$\leq 10$	$\leq 10$	$\mu\text{A}$
Emitter cutoff current ( $V_{EB} = 5\text{ V}$ )	$I_{EBO}$	$\leq 10$	$\leq 10$	$\leq 10$	$\mu\text{A}$
Collector-emitter breakdown voltage ( $I_{CEO} = 50\text{ mA}$ )	$V_{(BR)CEO}$	> 45	> 60	> 80	V
Condition for matching pairs ( $I_C = 150\text{ mA}$ ; $V_{CE} = 2\text{ V}$ )	$\frac{h_{FE1}}{h_{FE2}}$	$\leq 1.41$	$\leq 1.41$	$\leq 1.41$	—

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

Transition frequency ( $I_C = 50\text{ mA}$ ; $V_{CE} = 10\text{ V}$ ; $f = 100\text{ MHz}$ )	$f_T$	> 50	> 50	> 50	MHz
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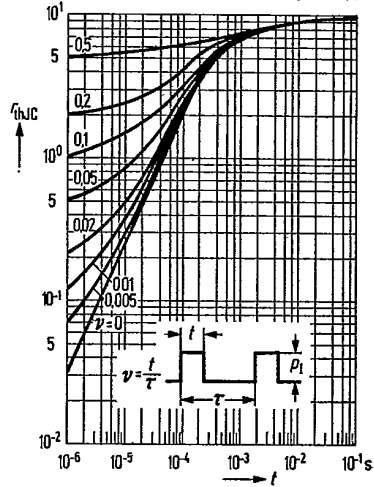
**Total perm. power dissipation  
versus temperature**

$P_{tot} = f(T); R_{th} = \text{parameter}$   
BD 135, BD 137, BD 139



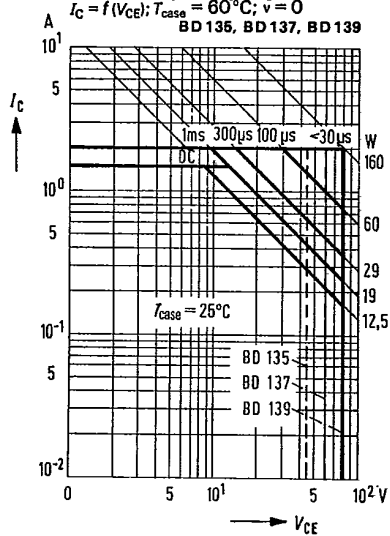
**Permissible pulse load**

$r_{thJC} = f(t); v = \text{parameter}$   
BD 135, BD 137, BD 139



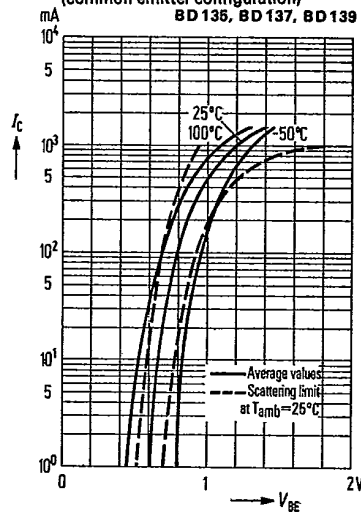
**Permissible operating range**

$I_C = f(V_{CE}); T_{case} = 60^\circ\text{C}; v = 0$   
BD 135, BD 137, BD 139

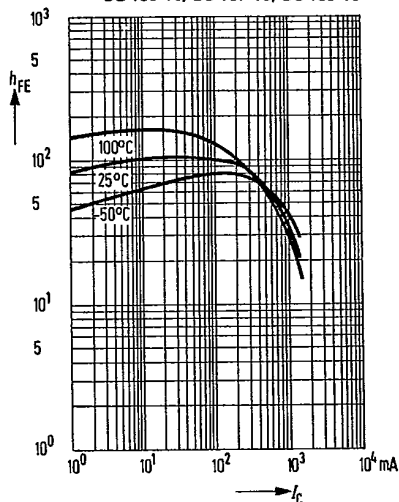


**Collector current  $I_C = f(V_{BE})$**

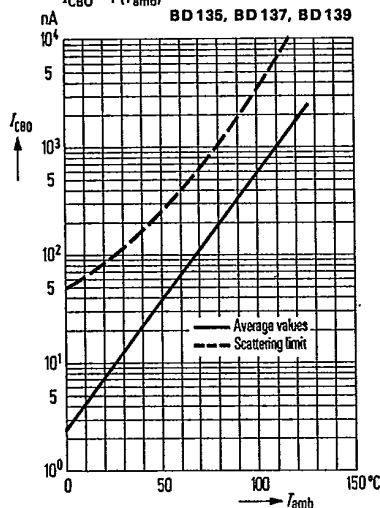
$V_{CE} = 2\text{ V}; T_{amb} = \text{parameter}$   
(common emitter configuration)  
BD 135, BD 137, BD 139



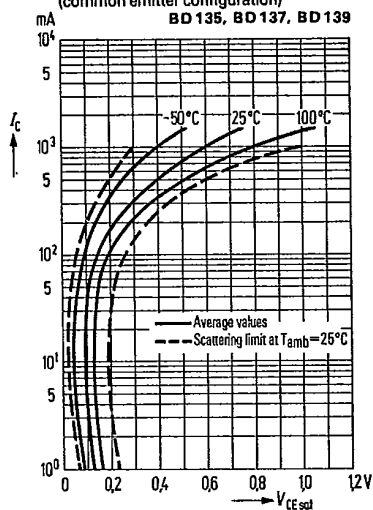
**DC current gain  $h_{FE} = f(I_C)$**   
 $V_{CE} = 2\text{ V}; T_{amb} = \text{parameter}$   
BD 135-10, BD 137-10, BD 139-10



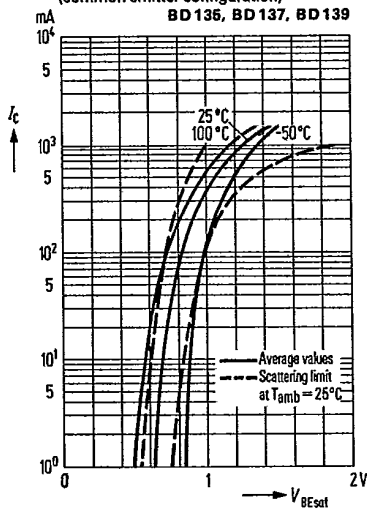
**Collector cutoff current versus temperature**  
 $I_{CBO} = f(T_{amb})$   
BD 135, BD 137, BD 139



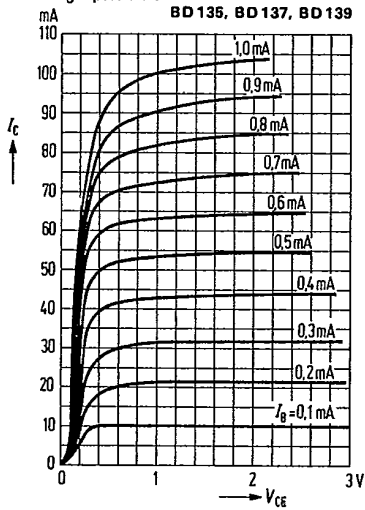
**Collector-emitter saturation voltage**  
 $V_{CEsat} = f(I_C)$   
 $h_{FE} = 10; T_{amb} = \text{parameter}$   
(common emitter configuration)  
BD 135, BD 137, BD 139



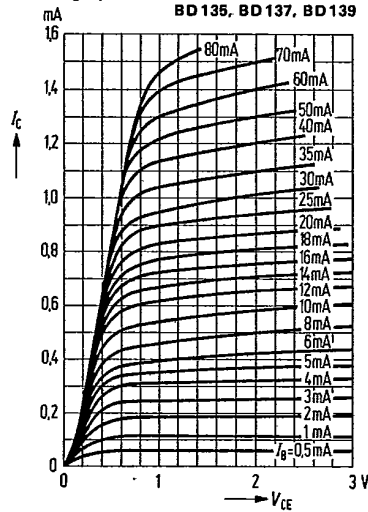
**Base-emitter saturation voltage**  
 $V_{BEsat} = f(I_C)$   
 $h_{FE} = 10; T_{amb} = \text{parameter}$   
(common emitter configuration)  
BD 135, BD 137, BD 139



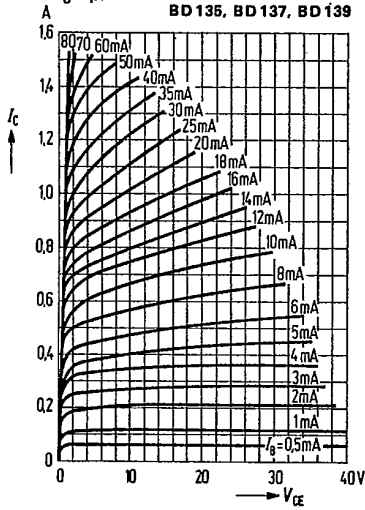
Output characteristics  $I_C = f(V_{CE})$   
 $I_B = \text{parameter}$



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



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



Transition frequency  $f_T = f(I_C)$   
 $(V_{CE} = 10 \text{ V})$

