PNP Silicon Planar Transistors

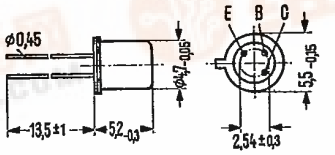
25C 04325 D

BCY 77
BCY 78
BCY 79

SIEMENS AKTIENGESELLSCHAF

BCY 77, BCY 78, and BCY 79 are epitaxial PNP silicon planar transistors in TO 18 cases (18 A 3 DIN 41876). The collector is electrically connected to the case. The transistors are particularly suitable for low noise AF input and driver stages. They can be used as complementary types to BCY 58, BCY 59, and BCY 65 E.

Type	Ordering code
BCY 77	Q62702-C327
BCY 77 VII	Q62702-C327-V1
BCY 77 VIII	Q62702-C327-V2
BCY 77 IX	Q62702-C327-V3
BCY 78	Q60203-Y78
BCY 78 VII	Q60203-Y78-G
BCY 78 VIII	Q60203-Y78-H
BCY 78 IX	Q60203-Y78-J
BCY 78 X	Q60203-Y78-K
BCY 79	Q60203-Y79
BCY 79 VII	Q60203-Y79-G
BCY 79 VIII	Q60203-Y79-H
BCY 79 IX	Q60203-Y79-J



Approx. weight 0.3 g Dimensions in mm

Maximum ratings		BCY 77	BCY 78	BCY 79	
Collector-emitter voltage	$-V_{CES}$	60	32	45	V
Collector-emitter voltage	$-V_{CEO}$	60	32	45	V
Emitter-base voltage	$-V_{EBO}$	5	5	5	V
Collector current	$-I_C$	100	200	200	mA
Base current	$-I_B$	50	50	50	mA
Junction temperature	T_j	200	200	200	°C
Storage temperature range	T_{stg}		−65 to +200		°C
Total power dissipation (T_{case} = 45 °C)	P_{tot}	1	1	1	W
Thermal resistance					
Junction to ambient air	R_{thJA}	≦450	≦450	≦450	K/W
Junction to case	R_{thJC}	≦150	≦150	≦150	K/W

Static characteristics (T_{amb} = 25 °C)

The transistors BCY 77, BCY 78, and BCY 79 are classified in groups of DC current gain h_{FE} and marked by Roman numerals.

Type		BCY 77 BCY 78 BCY 79	BCY 77 BCY 78 BCY 79	BCY 77 BCY 78 BCY 79	– BCY 78 –	BCY 77 BCY 78 BCY 79
h_{FE} group		VII	VIII	IX	X	
$-V_{CE}$ V	$-I_C$ mA	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	h_{FE} I_C/I_B	$-V_{BE}$ V
5	0.01	140	200 (>30)	270 (>40)	340 (>100)	0.55
5	2	170 (120 to 220)	250 (180 to 310)	350 (250 to 460)	500 (380 to 630)	0.65 (0.6 to 0.75)*
1	10	180 (>80)	260 (120 to 400)	360 (160 to 630)	500 (240 to 1000)	0.68
1[1]	100	>40	>45	>60	>60	0.75
1[2]	50	>40	>45	>60	>60	0.72

Saturation voltages	$-V_{CEsat}$	$-V_{BEsat}$	
(I_C = 10 mA; I_B = 0.25 mA)	0.12 (<0.25)	0.7 (<0.85)	V
(I_C = 100 mA; I_B = 2.5 mA)[1]	0.4 (<0.8)	0.85 (<1.2)	V
(I_C = 50 mA; I_B = 1.25 mA)[2]	0.4 (<0.8)	0.85 (<1.2)	V

1) applies only to BCY 78, BCY 79
2) applies only to BCY 77
*) AQL = 0.65%

Static characteristics (T_{amb} = 25 °C)		BCY 77	BCY 78	BCY 79	
Collector cutoff current ($-V_{CES}$ = 50 V)	$-I_{CES}$	2 (<20)	–	–	nA*
Collector cutoff current ($-V_{CES}$ = 25 V)	$-I_{CES}$	–	2 (<20)	–	nA*
Collector cutoff current ($-V_{CES}$ = 35 V)	$-I_{CES}$	–	–	2(<20)	nA*
Collector cutoff current ($-V_{CES}$ = 60 V)	$-I_{CES}$	<100	–	–	nA*
Collector cutoff current ($-V_{CES}$ = 32 V)	$-I_{CES}$	–	<100	–	nA
Collector cutoff current ($-V_{CES}$ = 45 V)	$-I_{CES}$	–	–	<100	nA
Collector cutoff current ($-V_{CES}$ = 60 V; T_{amb} = 150 °C)	$-I_{CES}$	<10	–	–	µA
Collector cutoff current ($-V_{CES}$ = 25 V; T_{amb} = 150 °C)	$-I_{CES}$	–	<10	–	µA
Collector cutoff current ($-V_{CES}$ = 35 V; T_{amb} = 150 °C)	$-I_{CES}$	–	–	<10	µA
Collector cutoff current ($-V_{CE}$ = 60 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	<20	–	–	µA
Collector cutoff current ($-V_{CE}$ = 32 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	–	<20	–	µA
Collector cutoff current ($-V_{CE}$ = 45 V; V_{BE} = 0.2 V; T_{amb} = 100 °C)	$-I_{CEX}$	–	–	<20	µA
Emitter cutoff current ($-V_{EBO}$ = 4 V)	$-I_{EBO}$	<20	<20	<20	nA*
Emitter-base breakdown voltage ($-I_{EBO}$ = 1 µA)	$-V_{(BR)EBO}$	>5	>5	>5	V*
Collector-emitter breakdown voltage ($-I_{CEO}$ = 2 mA)	$-V_{(BR)CEO}$	>60	>32	>45	V*
Collector-emitter breakdown voltage ($-I_{CES}$ = 10 µA)	$-V_{(BR)CES}$	>60	>32	>45	V

* AQL = 0.65%

Dynamic characteristics (T_{amb} = 25 °C)

		BCY 77, BCY 78, BCY 79	
Transition frequency ($-I_C$ = 10 mA; $-V_{CE}$ = 5 V; f = 100 MHz)	f_T	180	MHz
Collector-base capacitance ($-V_{CBO}$ = 10 V; f = 1 MHz)	C_{CBO}	4.5 (<7)	pF
Emitter-base capacitance ($-V_{EBO}$ = 0.5 V; f = 1 MHz)	C_{EBO}	11 (<15)	pF
Noise figure ($-I_C$ = 0.2 mA; $-V_{CE}$ = 5 V; R_g = 2 kΩ; f = 1 kHz; Δf = 200 Hz)	NF	2 (<6)	dB

Four-pole parameter ($-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 1 kHz)

Type	BCY 77 BCY 78 BCY 79	BCY 77 BCY 78 BCY 79	BCY 77 BCY 78 BCY 79	– BCY 78 –	
h_{FE} group	VII	VIII	IX	X	
h_{11e}	2.7 (1.6–4.5)	3.6 (2.5–6)	4.5 (3.2–8.5)	7.5	kΩ
h_{12e}	1.5	2	2	3	10^{-4}
h_{21e}	200	260	330	520	–

Switching times

BCY 77, BCY 78, BCY 79 Operating point:

I_C:I_{B1}:I_{B2} 10:1:1 mA; R_1 = 5 kΩ; R_2 = 5 kΩ; V_{BB} = 3.6 V; R_L = 990 Ω

t_d	35	ns	t_s	400	ns
t_r	50	ns	t_f	80	ns
t_{on}	85 (<150)	ns	t_{off}	480 (<800)	ns

BCY 78, BCY 79 Operating point:

I_C:I_{B1}:I_{B2} approx. 100:10:10 mA; R_1 = 500 Ω; R_2 = 700 Ω; V_{BB} = 5 V; R_L = 98 Ω

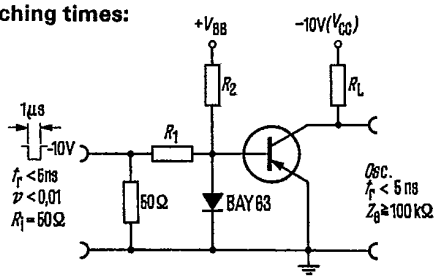
t_d	5	ns	t_s	250	ns
t_r	50	ns	t_f	200	ns
t_{on}	55 (<150)	ns	t_{off}	450 (<800)	ns

BCY 77 Operating point:

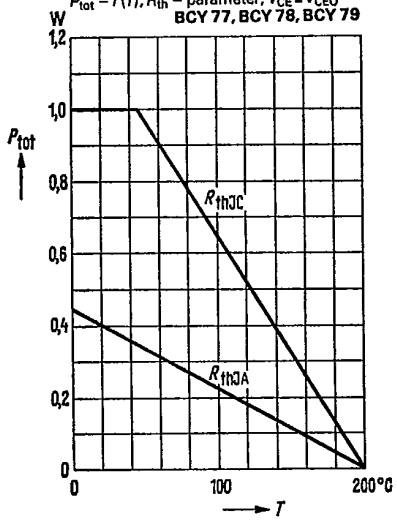
I_C:I_{B1}:I_{B2} approx. 50:5:5 mA; R_1 = 1 kΩ; R_2 = 1.3 kΩ; V_{BB} = 4.7 V; R_L = 195 Ω

t_d	15	ns	t_s	300	ns
t_r	50	ns	t_f	150	ns
t_{on}	65 (<150)	ns	t_{off}	450 (<800)	ns

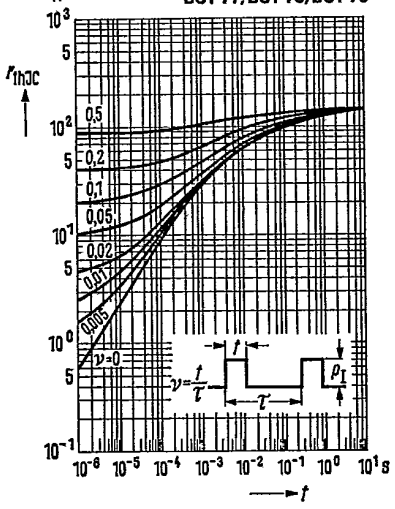
Test circuit for switching times:



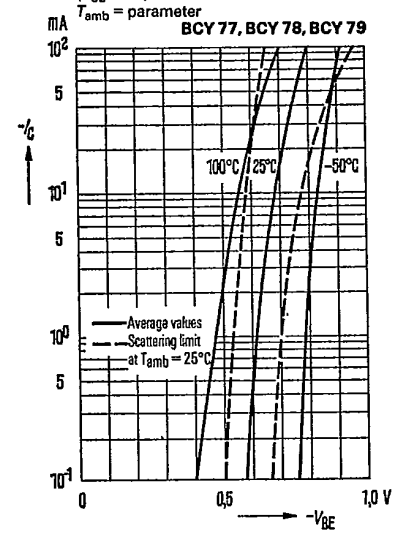
Total perm. power dissipation versus temperature
$P_{tot} = f(T)$; R_{th} = parameter; $V_{CE} \leq V_{CEO}$
BCY 77, BCY 78, BCY 79



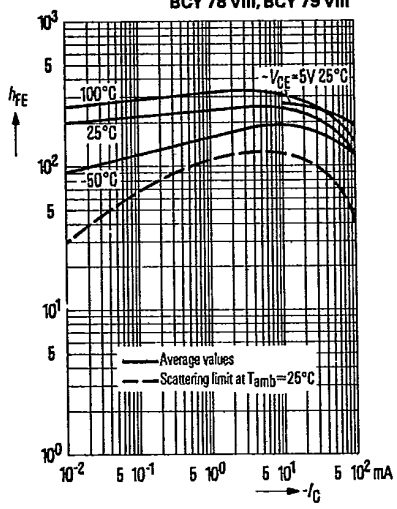
Permissible pulse load
$\frac{K}{W}$ $r_{thJC} = f(t)$; v = parameter
BCY 77, BCY 78, BCY 79



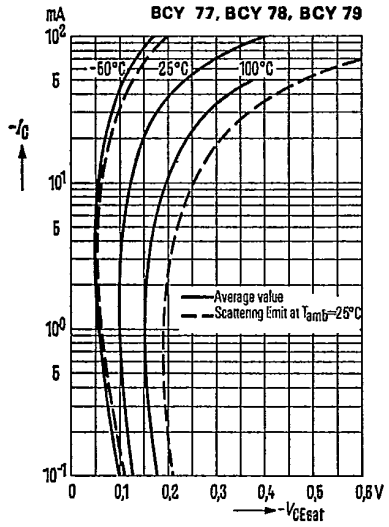
Collector current $I_C = f(V_{BE})$
($V_{CE} = 1$ V)
T_{amb} = parameter
BCY 77, BCY 78, BCY 79



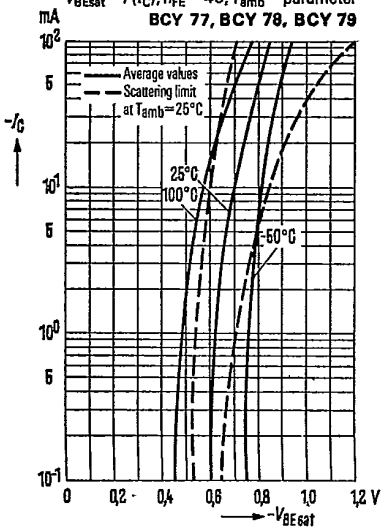
DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
BCY 78 VIII, BCY 79 VIII



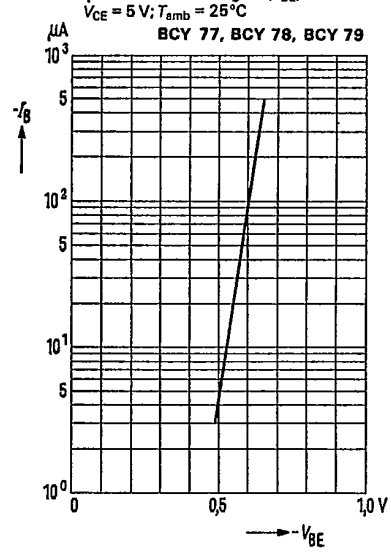
Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$; $h_{FE} = 40$; T_{amb} = parameter
BCY 77, BCY 78, BCY 79



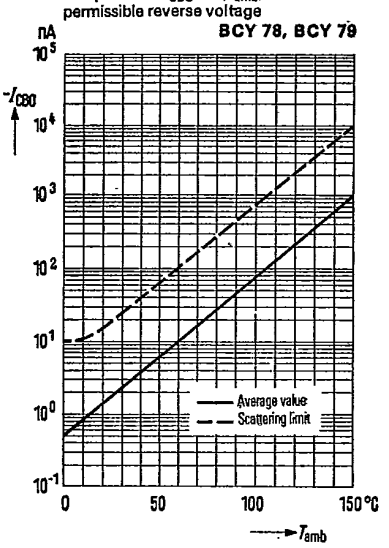
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$; $h_{FE} = 40$; T_{amb} = parameter
BCY 77, BCY 78, BCY 79



Input characteristic $I_B = f(V_{BE})$
$V_{CE} = 5$ V; $T_{amb} = 25$°C
BCY 77, BCY 78, BCY 79



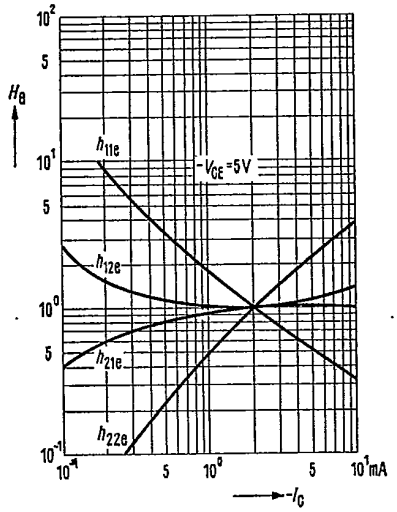
Collector cutoff current versus temperature $I_{CBO} = f(T_{amb})$ for max. permissible reverse voltage
BCY 78, BCY 79



h-parameter versus collector current

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

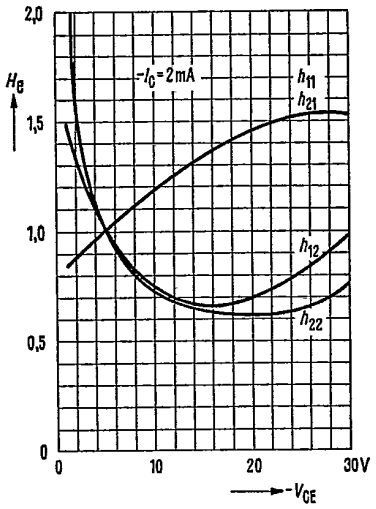
BCY 77, BCY 78, BCY 79



h-parameter versus collector-emitter voltage

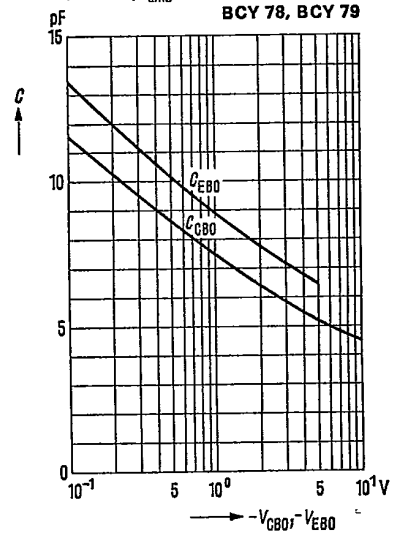
$H_e = \frac{h_e\,(V_{CE})}{h_e\,(V_{CE} = 5\,V)} = f\,(V_{CE})$

BCY 77, BCY 78, BCY 79



Collector-base capacitance
$C_{CBO} = f\,(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f\,(V_{EBO})$
$f = 1\,MHz$; $T_{amb} = 25°C$

BCY 78, BCY 79



Transition frequency $f_T = f\,(I_C)$
$-V_{CE} = 5\,V$; $T_{amb} = 25°C$

BCY 78, BCY 79