NPN Silicon Planar Transistors

BCY 58
BCY 59
BCY 65 E

BCY 58, BCY 59, and BCY 65 E are epitaxial NPN 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 AF input and driver stages as well as for switching applications.

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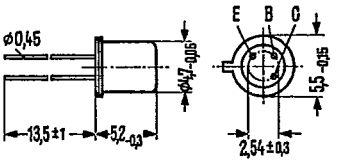
Type	Ordering code
BCY 58	Q60203-Y58
BCY 58 VII	Q60203-Y58-G
BCY 58 VIII	Q60203-Y58-H
BCY 58 IX	Q60203-Y58-J
BCY 58 X	Q60203-Y58-K
BCY 59	Q60203-Y59
BCY 59 VII	Q60203-Y59-G
BCY 59 VIII	Q60203-Y59-H
BCY 59 IX	Q60203-Y59-J
BCY 59 X	Q60203-Y59-K
BCY 65 E	Q60203-Y65-S2
BCY 65 E VII	Q60203-Y65-E7
BCY 65 E VIII	Q60203-Y65-E8
BCY 65 E IX	Q60203-Y65-E9



Approx. weight 0.3 g Dimensions in mm

Maximum ratings		BCY 58	BCY 59	BCY 65 E	
Collector-emitter voltage	V_{CES}	32	45	60	V
Collector-emitter voltage	V_{CEO}	32	45	60	V
Emitter-base voltage	V_{EBO}	7	7	7	V
Collector current	I_C	200	200	100	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 ($T_{case} \leqq 45$ °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 are grouped according to the DC current gain h_{FE} and marked by Roman numerals.

BCY 58
BCY 59
BCY 65E

T-29-23

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

Type		BCY 65 E	BCY 65 E	BCY 65 E	–	BCY 58
		BCY 58/59	BCY 58/59	BCY 58/59	BCY 58/59	BCY 59
h_{FE} group		VII	VIII	IX	X	BCY 65E
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	78	145 (>20)	220 (>40)	300 (>100)	0.5
5	2	170 (120 to 220)	250 (180 to 310)	350 (250 to 460)	500 (380 to 630)	0.62 (0.55 to 0.7)*
1	10	190 (>80)	260 (120 to 400)	380 (160 to 630)	550 (240 to 1000)	0.7
1	50[1]	>40	>45	>60	–	0.76
1	100[2]	>40	>45	>60	>60	0.76

Saturation voltages:	V_{CEsat}	V_{BEsat}	
(I_C = 10 mA; I_B = 0.25 mA)	0.12 (<0.35)	0.7 (<0.85)	V
(I_C = 10 mA; I_B = 2.5 mA)[2]	0.3 (<0.7)	0.9 (<1.2)	V
(I_C = 50 mA; I_B = 1.25 mA)[1]	0.1 (<0.7)	0.9 (<1.2)	V

		BCY 58	BCY 59	BCY 65E	
Collector cutoff current (V_{CES} = 32 V)	I_{CES}	0.2 (<10)	–	–	nA*
(V_{CES} = 45 V)	I_{CES}	–	0.2 (<10)	–	nA*
(V_{CES} = 60 V)	I_{CES}	–	–	0.2 (<10)	nA*
Collector cutoff current (V_{CES} = 32 V, T_{amb} = 150°C)	I_{CES}	0.2 (<10)	–	–	µA
(V_{CES} = 45 V; T_{amb} = 150°C)	I_{CES}	–	0.2 (<10)	–	µA
(V_{CES} = 60 V; T_{amb} = 150°C)	I_{CES}	–	–	0.2 (<10)	µA
Collector cutoff current (V_{CE} = 32 V; V_{BE} = 0.2 V; T_{amb} = 100°C)	I_{CEX}	<20	–	–	µA
(V_{CE} = 45 V; V_{BE} = 0.2 V; T_{amb} = 100°C)	I_{CEX}	–	<20	–	µA
(V_{CE} = 60 V; V_{BE} = 0.2 V; T_{amb} = 100°C)	I_{CEX}	–	–	<20	µA
Emitter cutoff current (V_{EBO} = 5 V)	I_{EBO}	<10	<10	<10	nA*
Collector-emitter breakdown voltage (I_{CEO} = 2 mA)	$V_{(BR)CEO}$	>32	>45	>60	V*
Emitter-base breakdown voltage (I_{EBO} = 1 µA)	$V_{(BR)EBO}$	>7	>7	>7	V*

1) applies only to BCY 65 E
2) applies only to BCY 58, BCY 59
*) AQL = 0.65%

Dynamic characteristics (T_{amb} = 25 °C)		**BCY 58**	**BCY 59**	**BCY 65 E**	
Transition frequency (I_C = 10 mA; V_{CE} = 5 V; f = 100 MHz)	f_T	250 (>125)	250 (>125)	250 (>125)	MHz
Collector-base capacitance (V_{CBO} = 10 V; f = 1 MHz)	C_{CBO}	3.5 (<6)	3.5 (<6)	3.5 (<6)	pF
Emitter-base capacitance (V_{EBO} = 0.5 V; f = 1 MHz)	C_{EBO}	8 (<15)	8 (<15)	8 (<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)	2 (<6)	2 (<6)	dB

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

h_{FE} group	VII	VIII	IX	X	
h_{11e}	2.7 (1.6 to 4.5)	3.6 (2.5 to 6)	4.5 (3.2 to 8.5)	7.5 (4.5 to 12)	kΩ
h_{12e}	1.5	2	2	3	10^{-4}
h_{21e}	200	260	330	520	–
h_{22e}	18 (<30)	24 (<50)	30 (<60)	50 (<100)	µS

Switching times:
Operating point: BCY 58; BCY 59; BCY 65 E
I_C:I_{B1}:$-I_{B2}$ approx. 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

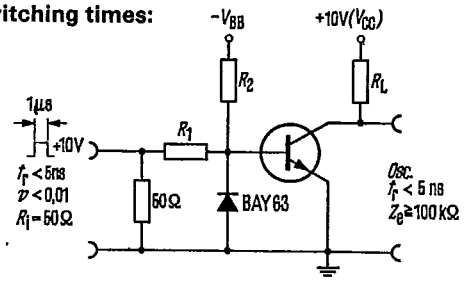
Switching times:
Operating point: BCY 58; BCY 59
I_C:I_{B1}:$-I_{B2}$ approx. 100:10:10 mA; R_1 = 500 Ω; R_2 = 700 Ω; V_{BB} = 5 V; R_L = 98 Ω

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

Switching times:
Operating point: BCY 65 E
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:



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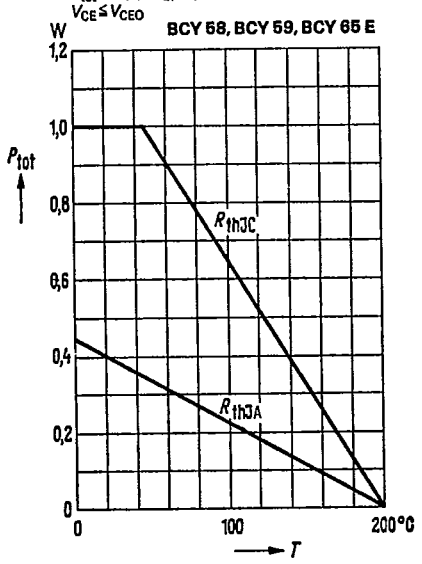
Total perm. power dissipation versus temperature
$P_{tot} = f(T)$; R_{th} = parameter;
$V_{CE} \leq V_{CEO}$
BCY 58, BCY 59, BCY 65 E



Permissible pulse load
$r_{thJC} = f(t)$; ν = parameter
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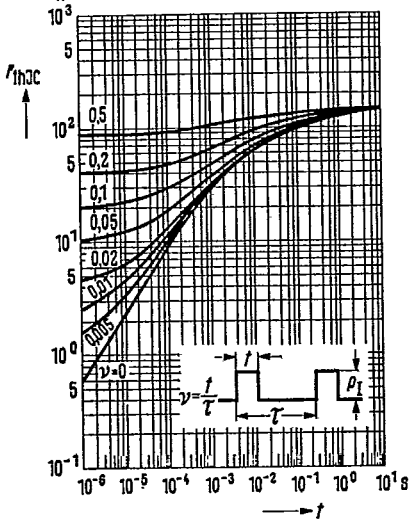
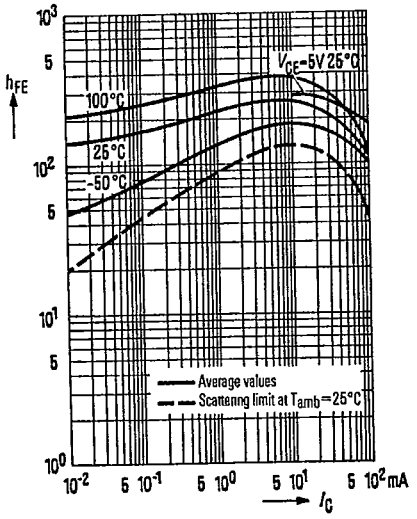
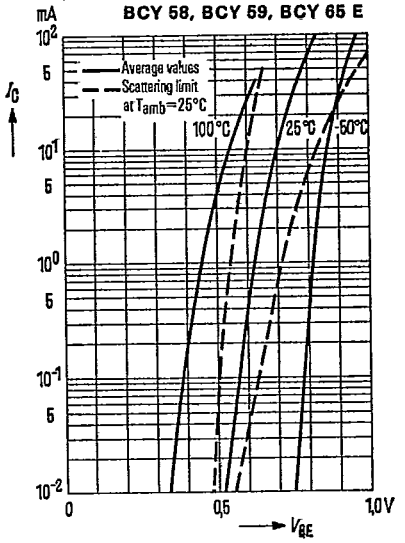


DC current gain $h_{FE} = f(I_C)$
$V_{CE} = 1$ V; T_{amb} = parameter
(common emitter configuration)



Collector current $I_C = f(V_{BE})$
$V_{CE} = 1$ V
(common emitter configuration)
BCY 58, BCY 59, BCY 65 E



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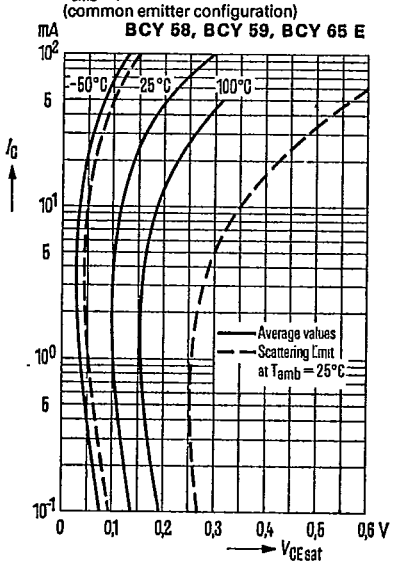
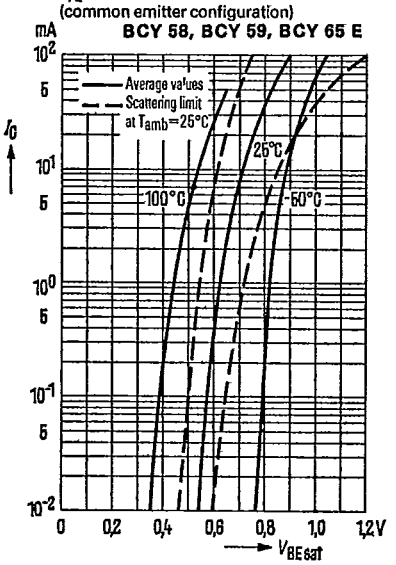
BCY 59
BCY 65 E

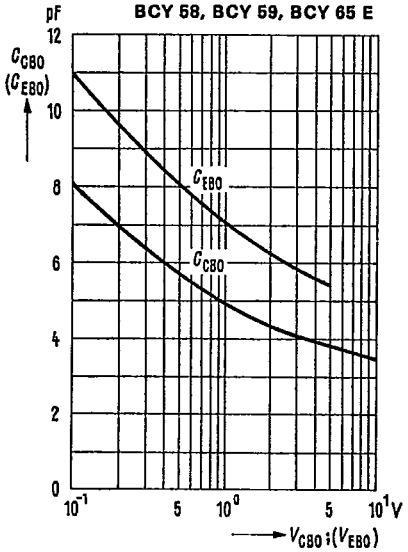
Collector emitter saturation voltage
$V_{CEsat} = f(I_C)$; $h_{FE} = 40$
T_{amb} = parameter
(common emitter configuration)



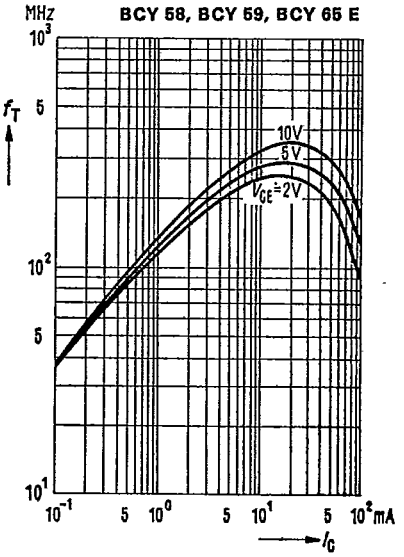
Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$; T_{amb} = parameter;
$h_{FE} = 40$
(common emitter configuration)



Collector-base capacitance
$C_{CBO} = f(V_{CBO})$
Emitter-base capacitance
$C_{EBO} = f(V_{EBO})$



Transition frequency $f_T = f(I_C)$;
V_{CE} = parameter



h-parameter versus collector current

$H_e = \frac{h_e\,(I_C)}{h_e\,(I_C = 2\text{ mA})} = f\,(I_C);\ V_{CE} = 5\text{ V}$

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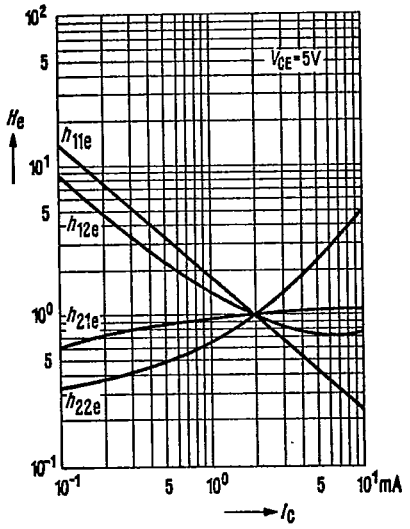
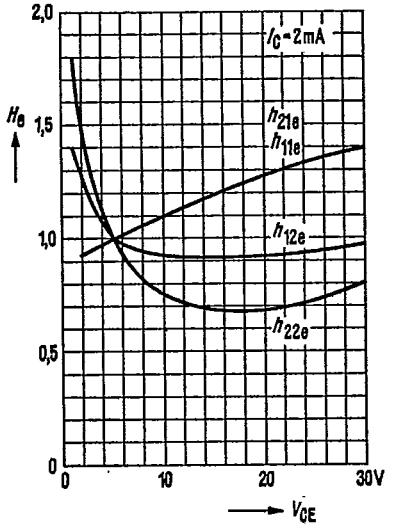


h-parameter versus collector-emitter voltage

$H_e = \frac{h_e\,(V_{CE})}{h_e\,(V_{CE} = 5\text{ V})} = f\,(V_{CE});\ I_C = 2\text{ mA}$

BCY 58, BCY 59, BCY 65 E



Input characteristic $I_B = f\,(V_{BE})$
V_{CE} = 5 V
(common emitter configuration)

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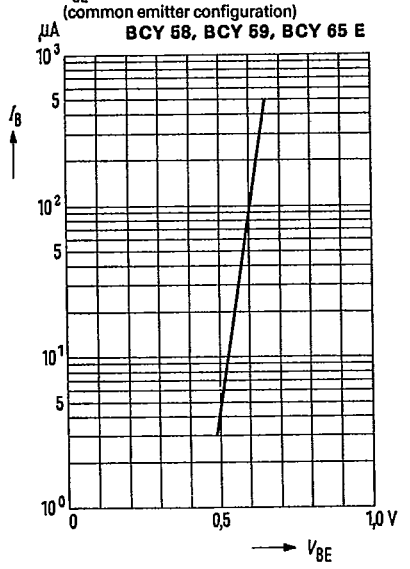

Collector cutoff current versus temperature $I_{CBO} = f\,(T_{amb})$ **for max. permissible reverse voltage**

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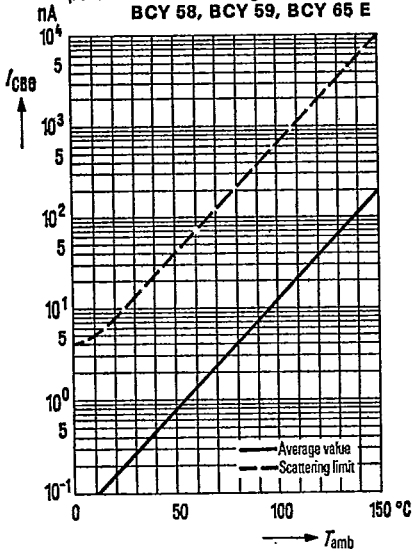

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