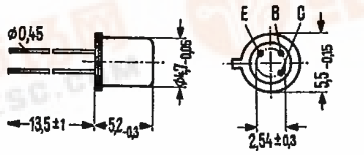
NPN Transistors for Switching Applications

SIEMENS AKTIENGESELLSCHAF D

BSY 17
BSY 18
BSY 62
BSY 63

BSY 17, BSY 18, BSY 62, and BSY 63 are double-diffused epitaxial NPN silicon planar RF transistors in TO 18 case (18 A 3 DIN 41876). Their collectors are electrically connected to their cases. Transistor BSY 17 corresponds to type 2 N 743, BSY 18 to 2 N 744, BSY 62, group A, to type 2 N 706 A, and BSY 63 to type 2 N 708. The transistors are especially suitable for high-speed logic gate applications.

Type	Ordering code
BSY 17	Q60218-Y17
BSY 18	Q60218-Y18
BSY 62 A	Q60218-Y62-A
BSY 62 B	Q60218-Y62-B
BSY 63	Q60218-Y63



Approx. weight 0.3 g — Dimensions in mm

Maximum ratings

		BSY 17 BSY 18	BSY 62	BSY 63	
Collector-emitter voltage	V_{CEO}	12	15	15	V
Collector-base voltage	V_{CBO}	20	25	40	V
Emitter-base voltage	V_{EBO}	5	5	5	V
Collector current	I_C	200	200	200	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}	≤ 500	≤ 500	≤ 500	K/W
Junction to case	R_{thJC}	≤ 150	≤ 150	≤ 150	K/W

Static characteristics

		BSY 17		
	T_{amb}	170	25	°C
Collector cutoff current (V_{CBO}=20 V)	I_{CBO}	<100	<1*	µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	–	>12	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	–	>5*	V
Collector-base breakdown voltage (I_{CBO} = 1 µA)	$V_{(BR)CBO}$	–	>20	V

* AQL = 0.65%

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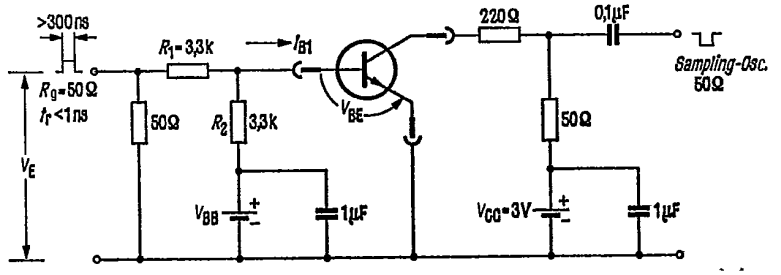
Static characteristics

		BSY 18		
	T_{amb}	170	25	°C
Collector cutoff current (V_{CBO} = 20 V)	I_{CBO}	<100	<1*	µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	–	>12	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	–	>5*	V
		BSY 62		
	T_{amb}	150	25	°C
Collector cutoff current (V_{CBO} = 15 V)	I_{CBO}	<30	<0.5*	µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	–	>15	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	–	>5*	V
Collector-base breakdown voltage (I_{CBO} = 1 µA)	$V_{(BR)CBO}$	–	>25	V
		BSY 63		
	T_{amb}	150	25	°C
Collector cutoff current (V_{CBO} = 20 V)	I_{CBO}	<15	0.003	µA
Collector cutoff current (V_{CE} = 20 V; V_{BE} = 0.25 V; T_{amb} = 125 °C)	I_{CEV}	<10	(<0.025)* –	µA µA
Collector-emitter breakdown voltage (I_{CEO} = 10 mA)	$V_{(BR)CEO}$	–	>15	V
Emitter-base breakdown voltage (I_{EBO} = 10 µA)	$V_{(BR)EBO}$	–	>5*	V
Collector-base breakdown voltage (I_{CBO} = 1 µA)	$V_{(BR)CBO}$	–	>40	V

* AQL = 0.65%

Test circuit for turn-on and turn-off time measurements Duty cycle < 2%



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BSY 17
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BSY 62
BSY 63

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

BSY 17

V_{CE} V	I_B mA	I_C mA	h_{FE} I_C/I_B	V_{BEsat} [1] V	V_{CEsat} [1] V
0.25	<0.1	1	>10*	0.65	–
0.35	0.167 to 0.5	10	20 to 60*	0.7 (<0.85)	<0.28*
1.0	<10	100	>10*	<1.5	–

BSY 18

V_{CE} V	I_B mA	I_C mA	h_{FE} I_C/I_B	V_{BEsat} [1] V	V_{CEsat} [1] V
0.25	<0.05	1	>20*	0.66	–
0.35	0.083 to 0.25	10	40 to 120*	0.7 (<0.85)	<0.28*
1.0	<5.0	100	>20*	<1.5	–

BSY 62 The transistors are grouped according to the DC current gain h_{FE} and identified by the code letters "A" or "B".

h_{FE} group	V_{CE} V	I_B mA	I_C mA	h_{FE} I_C/I_B
A	1	0.17 to 0.5	10	20 to 60*
B	1	0.033 to 0.33	10	30 to 300*

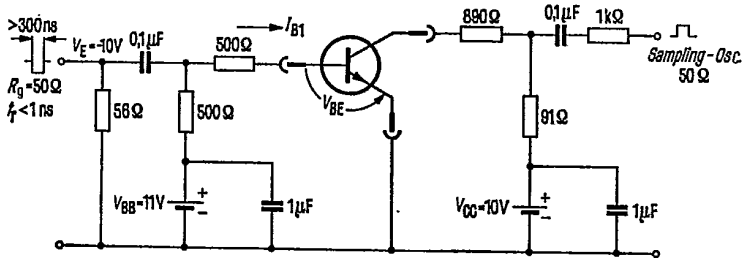
Saturation voltage (I_C = 10 mA; I_B = 10 mA) V_{BEsat} [1] = <0.9 V
V_{CEsat} [1] = <0.6* V

BSY 63

V_{CE} V	I_B mA	I_C mA	h_{FE} I_C/I_B
1	<0.033	0.5	>15*
1	0.083 to 0.33	10	30 to 120*

Saturation voltage (I_C = 10 mA; I_B = 1 mA) V_{BEsat} [1] = 0.72 (<0.8) V
V_{CEsat} [1] = <0.4* V

Test circuit for storage time (t_s) Duty cycle <2%



1) The transistor is saturated to such an extent that the DC current gain decreases to h_{FE} = 10.
* AQL = 0.65%

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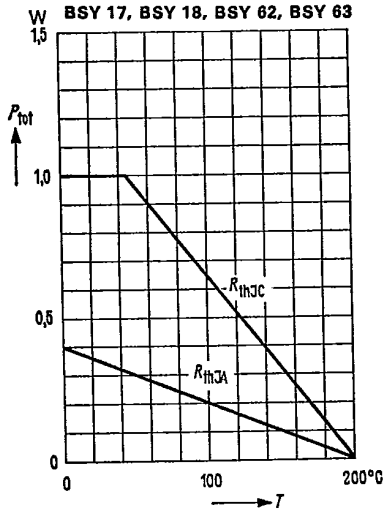
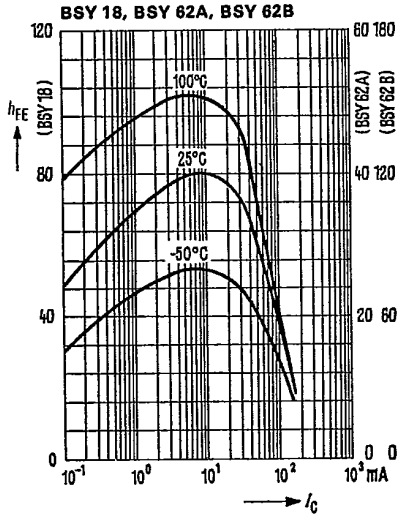
Dynamic characteristics (T_{amb} = 25°C)		**BSY 17**	**BSY 18**	**BSY 62**	**BSY 63**	
Transition frequency (I_C = 10 mA; V_{CE} = 10 V; f = 100 MHz)	f_T	>280	>280	>280	>300	MHz
Collector-base capacitance (V_{CBO} = 5 V)	C_{CBO}	2.7 (<5)	2.7 (<5)	2.7 (<5)	2.7 (<6)	pF
Switching times:						
Operating point:						
I_C = 10 mA; I_{B1} = 3 mA;	t_{on}	<16	<16	<40	<40	ns
$-I_{B2}$ = 1.5 mA; R_L = 270 Ω	t_{off}	<24	<24	<75	<75	ns
Operating point:						
I_C = 100 mA; I_{B1} = 40 mA;	t_{on}	7	7	–	–	ns
$-I_{B2}$ = 20 mA; R_L = 50 Ω	t_{off}	25	25	–	–	ns
$I_C = I_{B1} = -I_{B2}$ = 10 mA; R_L = 1 kΩ	t_{stg}	<14	<18	<25	<25	ns

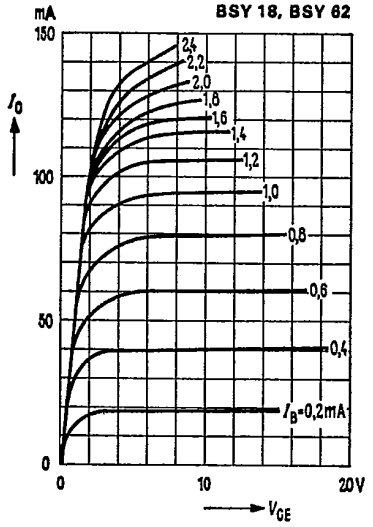
Total perm. power dissipation versus temperature
$P_{tot} = f(T)$; R_{th} = parameter
BSY 17, BSY 18, BSY 62, BSY 63



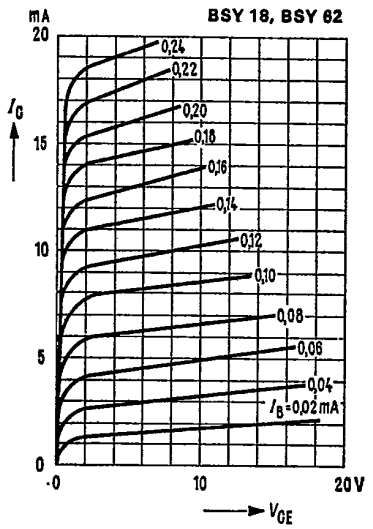
DC current gain $h_{FE} = f(I_C)$
V_{CE} = 1 V; T_{amb} = parameter
(common emitter configuration)
BSY 18, BSY 62A, BSY 62B



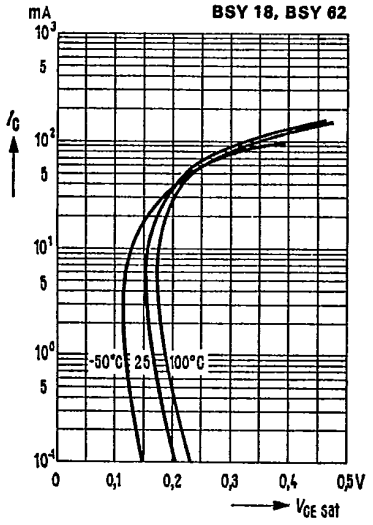
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter configuration)



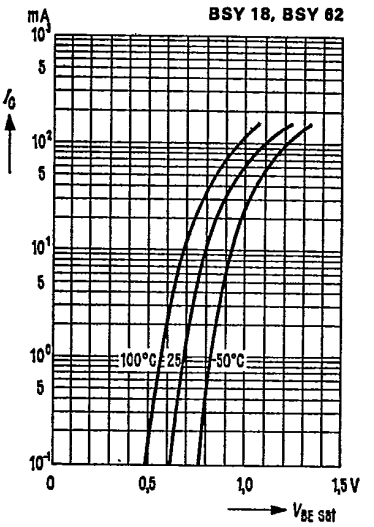
Output characteristics $I_C = f(V_{CE})$
I_B = parameter
(common emitter configuration)



Collector-emitter saturation voltage
$V_{CEsat} = f(I_C)$; $h_{FE} = 10$
T_{amb} = parameter

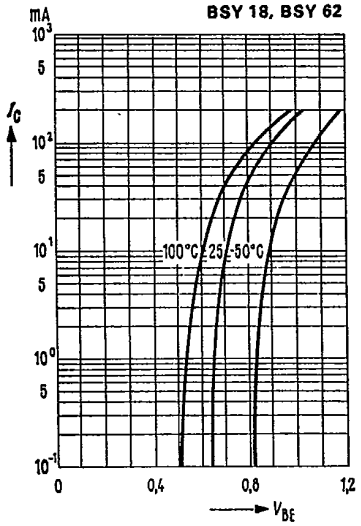


Base-emitter saturation voltage
$V_{BEsat} = f(I_C)$; $h_{FE} = 10$
T_{amb} = parameter

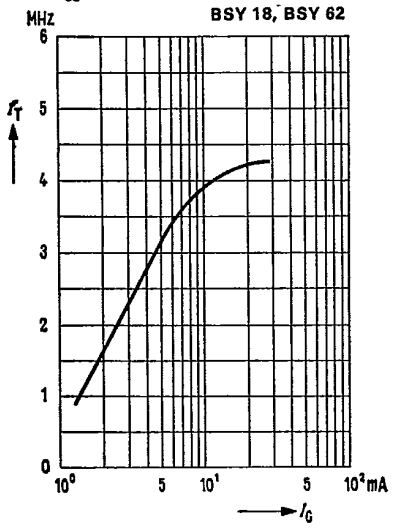


BSY 17
BSY 18
BSY 62

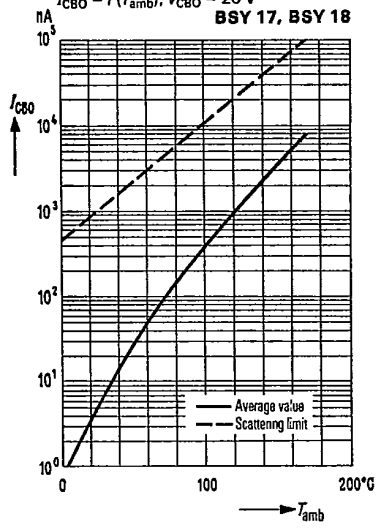
Collector current $I_C = f(V_{BE})$
V_{CE} = 1 V
(common emitter configuration)
BSY 18, BSY 62



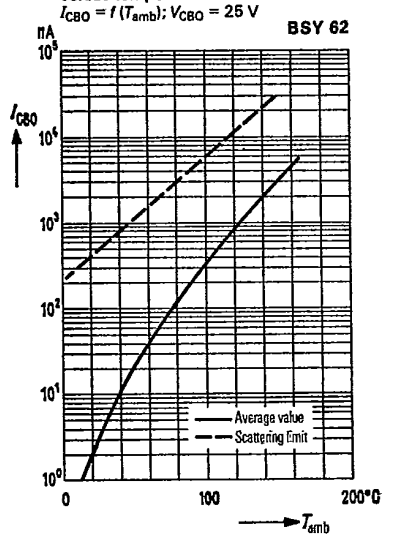
Transition frequency $f_T = f(I_C)$
V_{CE} = 10 V; f = 100 MHz; T_{amb} = 25 °C
BSY 18, BSY 62



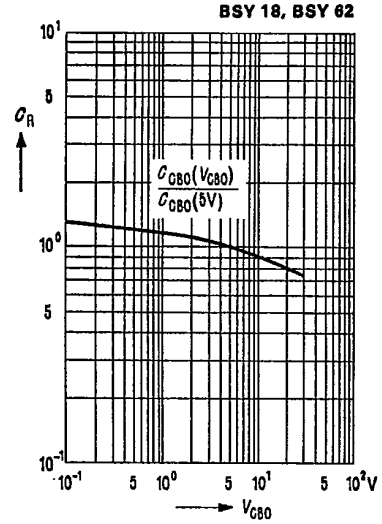
Collector cutoff current versus temperature
$I_{CBO} = f(T_{amb})$; V_{CBO} = 20 V
BSY 17, BSY 18



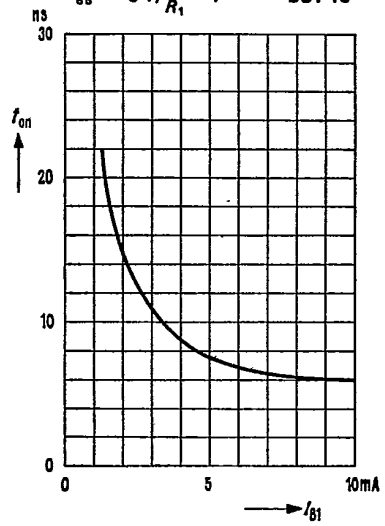
Collector cutoff current versus temperature
$I_{CBO} = f(T_{amb})$; V_{CBO} = 25 V
BSY 62



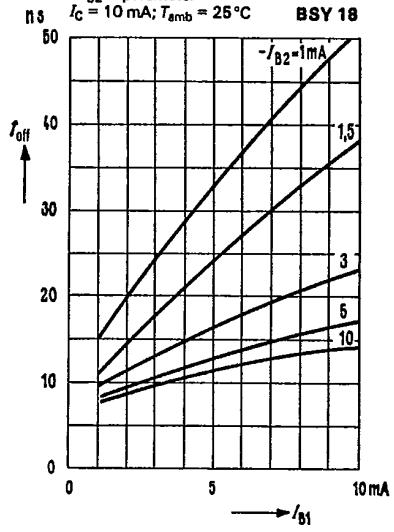
Collector-base capacitance
$C_R = f(V_{CBO})$



Turn-on time $t_{on} = f(h_{FE1})$
I_C = 10 mA; T_{amb} = 25 °C
V_{BB} = −3 V; $\frac{R_2}{R_1}$ = 1 BSY 18



Turn-off time $t_{off} = f(I_{B1})$
$-I_{B2}$ = parameter
I_C = 10 mA; T_{amb} = 25 °C BSY 18



Storage time $t_s = f(I_{B1})$
$-I_{B2}$ = parameter
I_C = 10 mA; T_{amb} = 25 °C BSY 18