

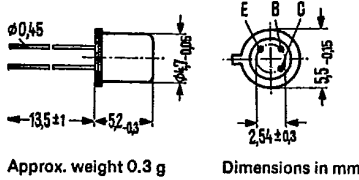
NPN Transistors for Switching Applications

**BSY 17
BSY 18
BSY 62
BSY 63**

SIEMENS AKTIENGESELLSCHAFT

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



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 ($T_{case} = 45^\circ\text{C}$)	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 ($V_{CBO} = 20\text{ V}$)	I_{CBO}	< 100	< 1*	μA
Collector-emitter breakdown voltage ($I_{CEO} = 10\text{ mA}$)	$V_{(BR)CEO}$	-	> 12	V
Emitter-base breakdown voltage ($I_{EBO} = 10\text{ μA}$)	$V_{(BR)EBO}$	-	> 5*	V
Collector-base breakdown voltage ($I_{CBO} = 1\text{ μA}$)	$V_{(BR)CBO}$	-	> 20	V

* AQL = 0.66%

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Static characteristics

Collector cutoff current
 ($V_{CB0} = 20\text{ V}$)
 Collector-emitter breakdown voltage
 ($I_{CEO} = 10\text{ mA}$)
 Emitter-base breakdown voltage
 ($I_{EBO} = 10\text{ }\mu\text{A}$)

BSY 18			
T_{amb}	170	25	°C
I_{CBO}	<100	<1*	μA
$V_{(BR)CEO}$	-	>12	V
$V_{(BR)EBO}$	-	>5*	V

Collector cutoff current
 ($V_{CB0} = 15\text{ V}$)
 Collector-emitter breakdown voltage
 ($I_{CEO} = 10\text{ mA}$)
 Emitter-base breakdown voltage
 ($I_{EBO} = 10\text{ }\mu\text{A}$)
 Collector-base breakdown voltage
 ($I_{CBO} = 1\text{ }\mu\text{A}$)

BSY 62			
T_{amb}	150	25	°C
I_{CBO}	<30	<0.5*	μA
$V_{(BR)CEO}$	-	>15	V
$V_{(BR)EBO}$	-	>5*	V
$V_{(BR)CBO}$	-	>25	V

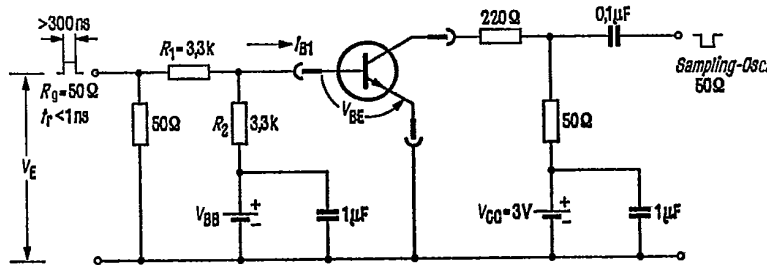
Collector cutoff current
 ($V_{CB0} = 20\text{ V}$)
 Collector cutoff current
 ($V_{CE} = 20\text{ V}; V_{BE} = 0.25\text{ V};$
 $T_{amb} = 125\text{ }^\circ\text{C}$)
 Collector-emitter breakdown voltage
 ($I_{CEO} = 10\text{ mA}$)
 Emitter-base breakdown voltage
 ($I_{EBO} = 10\text{ }\mu\text{A}$)
 Collector-base breakdown voltage
 ($I_{CBO} = 1\text{ }\mu\text{A}$)

BSY 63			
T_{amb}	150	25	°C
I_{CBO}	<15	0.003	μA
I_{CEV}	<10	(<0.025)*	μA
$V_{(BR)CEO}$	-	>15	V
$V_{(BR)EBO}$	-	>5*	V
$V_{(BR)CBO}$	-	>40	V

* AQL = 0.65%

Test circuit for turn-on and turn-off time measurements

Duty cycle <2%



BSY 17
 BSY 18
 BSY 62
 BSY 63

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

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 ($I_C = 10\text{ mA}$; $I_B = 10\text{ mA}$) $V_{BEsat}^{1)} = <0.9\text{ V}$
 $V_{CEsat}^{1)} = <0.6^*\text{ V}$

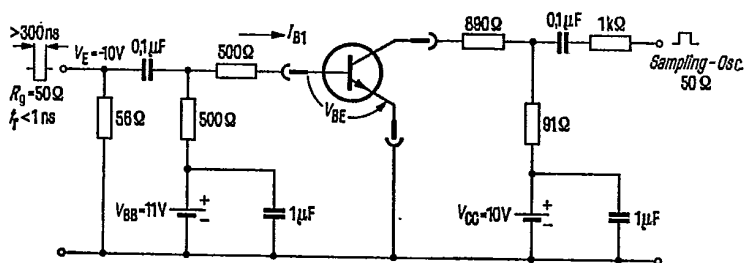
BSY 63

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 ($I_C = 10\text{ mA}$; $I_B = 1\text{ mA}$) $V_{BEsat}^{1)} = 0.72 (<0.8)\text{ V}$
 $V_{CEsat}^{1)} = <0.4^*\text{ V}$

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

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

Transition frequency

($I_C = 10\text{ mA}$; $V_{CE} = 10\text{ V}$;
 $f = 100\text{ MHz}$)

Collector-base capacitance
($V_{CBO} = 5\text{ V}$)

	BSY 17	BSY 18	BSY 62	BSY 63	
f_T	>280	>280	>280	>300	MHz
C_{CBO}	2.7 (<5)	2.7 (<5)	2.7 (<5)	2.7 (<6)	pF

Switching times:

Operating point:

$I_C = 10\text{ mA}$; $I_{B1} = 3\text{ mA}$;
 $-I_{B2} = 1.5\text{ mA}$; $R_L = 270\ \Omega$

t_{on}	<16	<16	<40	<40	ns
t_{off}	<24	<24	<75	<75	ns

Operating point:

$I_C = 100\text{ mA}$; $I_{B1} = 40\text{ mA}$;
 $-I_{B2} = 20\text{ mA}$; $R_L = 50\ \Omega$

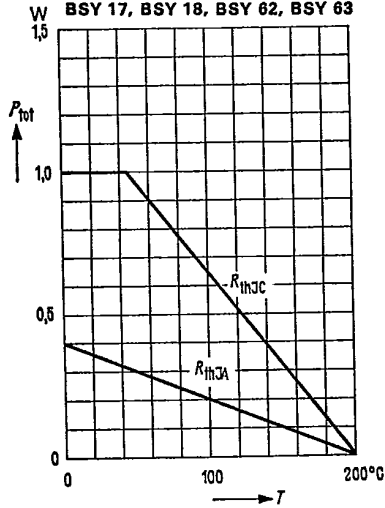
t_{on}	7	7	-	-	ns
t_{off}	25	25	-	-	ns

$I_C = I_{B1} = -I_{B2} = 10\text{ mA}$;
 $R_L = 1\text{ k}\Omega$

t_{stg}	<14	<18	<25	<25	ns
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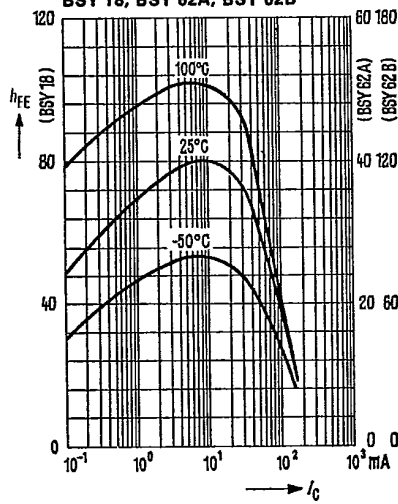
Total perm. power dissipation versus temperature
 $P_{tot} = f(T)$; R_{th} = parameter

BSY 17, BSY 18, BSY 62, BSY 63



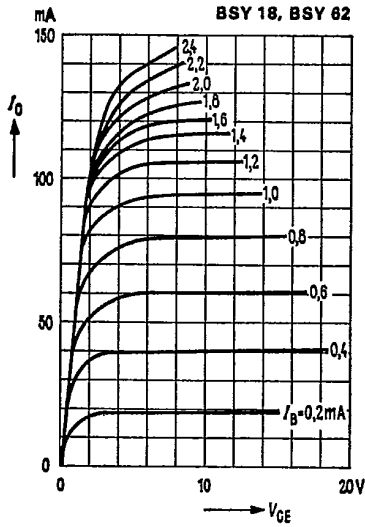
DC current gain $h_{FE} = f(I_C)$
 $V_{CE} = 1\text{ V}$; $T_{amb} = \text{parameter}$
(common emitter configuration)

BSY 18, BSY 62A, BSY 62B

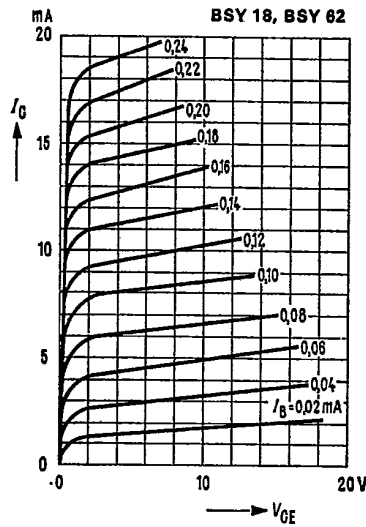


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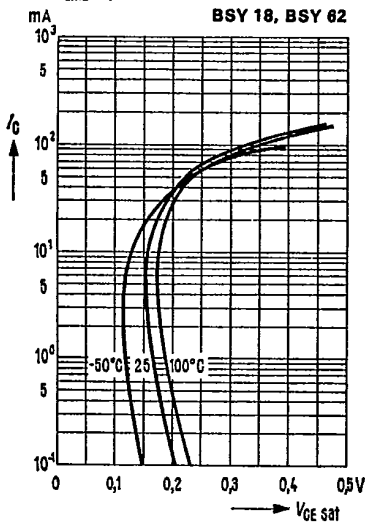
Output characteristics $I_C = f(V_{CE})$
 $I_B = \text{parameter}$
 (common emitter configuration)



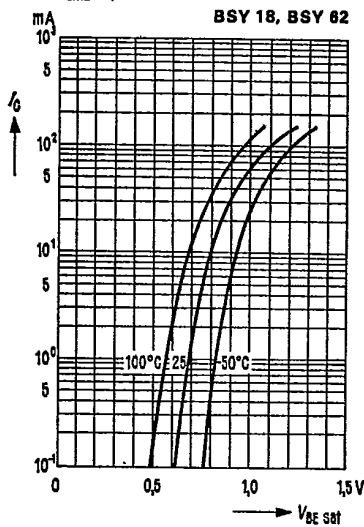
Output characteristics $I_C = f(V_{CE})$
 $I_B = \text{parameter}$
 (common emitter configuration)

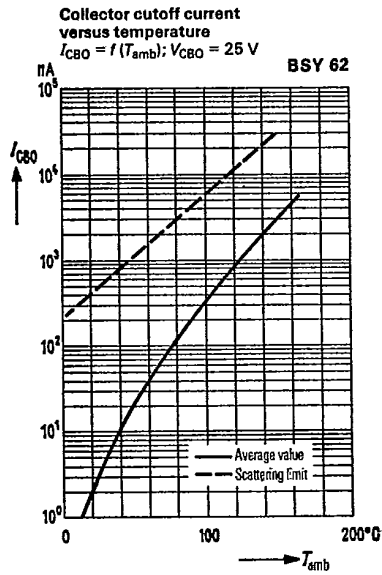
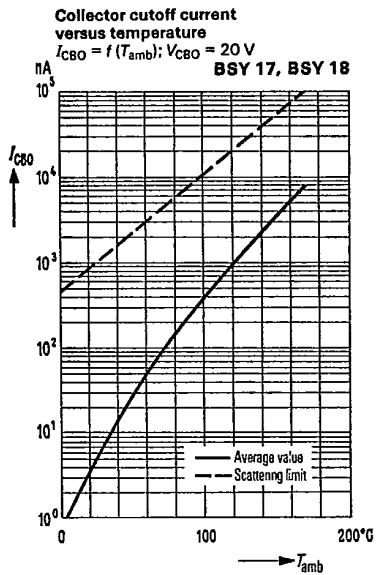
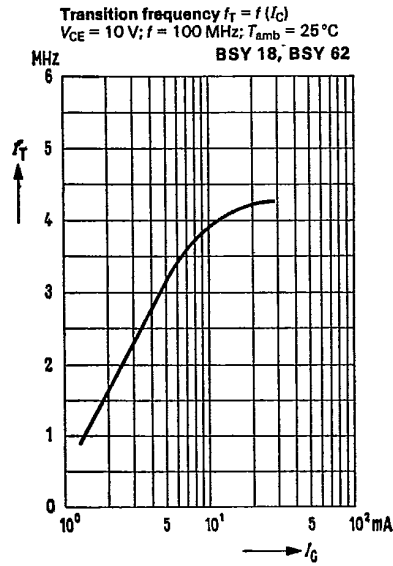
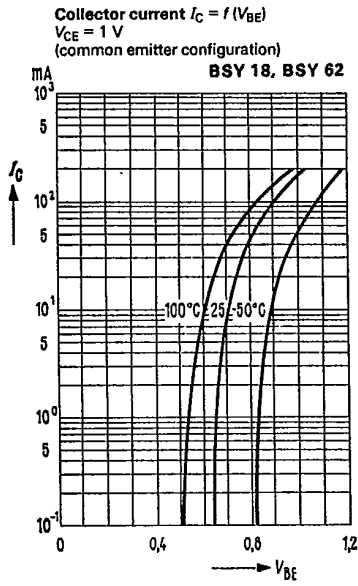


Collector-emitter saturation voltage
 $V_{CEsat} = f(I_C); h_{FE} = 10$
 $T_{amb} = \text{parameter}$

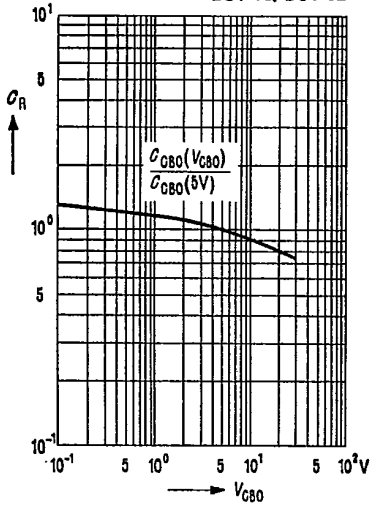


Base-emitter saturation voltage
 $V_{BEsat} = f(I_C); h_{FE} = 10$
 $T_{amb} = \text{parameter}$

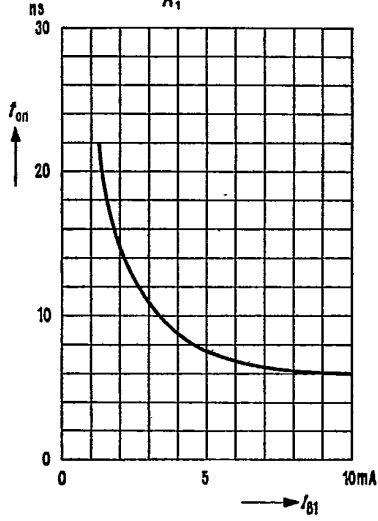




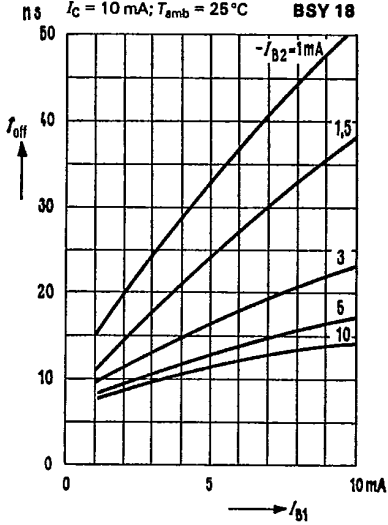
Collector-base capacitance
 $C_R = f(V_{CB0})$
 BSY 18, BSY 62



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



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



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

