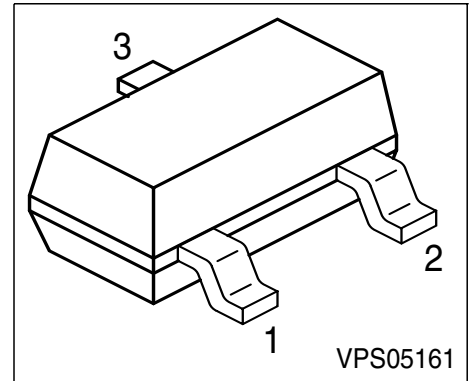


**PNP Silicon Switching Transistor**

- High DC current gain: 0.1mA to 500 mA
- Low collector-emitter saturation voltage
- Complementary type:  
SMBT2222A/ MMBT2222A (NPN)



Type	Marking	Pin Configuration			Package
SMBT2907A/MMBT2907A	s2F	1=B	2=E	3=C	SOT23

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$	60	V
Collector-base voltage	$V_{CBO}$	60	
Emitter-base voltage	$V_{EBO}$	5	
DC collector current	$I_C$	600	mA
Total power dissipation, $T_S = 77\text{ °C}$	$P_{tot}$	330	mW
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-65 ... 150	

**Thermal Resistance**

Junction - soldering point <sup>1)</sup>	$R_{thJS}$	≤220	K/W
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<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>DC Characteristics</b>					
Collector-emitter breakdown voltage $I_C = 10\text{ mA}, I_B = 0$	$V_{(BR)CEO}$	60	-	-	V
Collector-base breakdown voltage $I_C = 10\text{ }\mu\text{A}, I_E = 0$	$V_{(BR)CBO}$	60	-	-	
Emitter-base breakdown voltage $I_E = 10\text{ }\mu\text{A}, I_C = 0$	$V_{(BR)EBO}$	5	-	-	
Collector cutoff current $V_{CB} = 50\text{ V}, I_E = 0$	$I_{CBO}$	-	-	10	nA
Collector cutoff current $V_{CB} = 50\text{ V}, I_E = 0, T_A = 150\text{ }^\circ\text{C}$	$I_{CBO}$	-	-	10	$\mu\text{A}$
Emitter cutoff current $V_{EB} = 3\text{ V}, I_C = 0$	$I_{EBO}$	-	-	10	nA
DC current gain 1) $I_C = 100\text{ }\mu\text{A}, V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}, V_{CE} = 10\text{ V}$ $I_C = 500\text{ mA}, V_{CE} = 10\text{ V}$	$h_{FE}$	75 100 100 100 50	- - - - -	- - - 300 -	-
Collector-emitter saturation voltage1) $I_C = 150\text{ mA}, I_B = 15\text{ mA}$ $I_C = 500\text{ mA}, I_B = 50\text{ mA}$	$V_{CEsat}$	- -	- -	0.4 1.6	V
Base-emitter saturation voltage 1) $I_C = 150\text{ mA}, I_B = 15\text{ mA}$ $I_C = 500\text{ mA}, I_B = 50\text{ mA}$	$V_{BEsat}$	- -	- -	1.3 2.6	

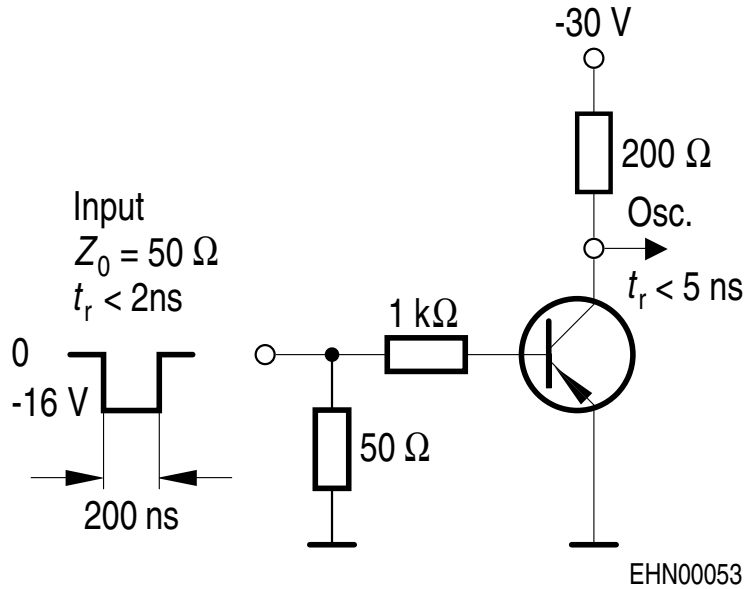
 1) Pulse test:  $t \leq 300\mu\text{s}$ ,  $D = 2\%$

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified.

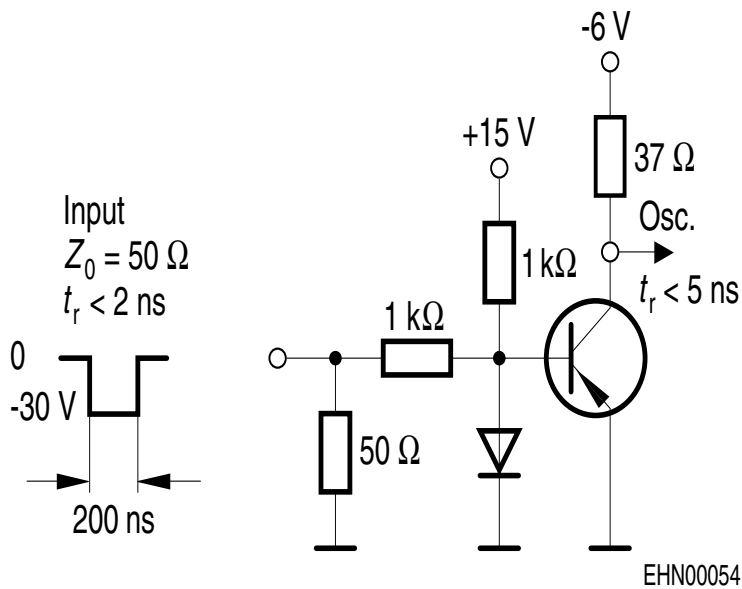
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b>					
Transition frequency $I_C = 20\text{ mA}, V_{CE} = 20\text{ V}, f = 100\text{ MHz}$	$f_T$	200	-	-	MHz
Collector-base capacitance $V_{CB} = 10\text{ V}, f = 1\text{ MHz}$	$C_{cb}$	-	-	8	pF
Emitter-base capacitance $V_{EB} = 0.5\text{ V}, f = 1\text{ MHz}$	$C_{eb}$	-	-	30	
Delay time $V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1} = 15\text{ mA}, V_{BE(off)} = 0.5\text{ V}$	$t_d$	-	-	10	ns
Rise time $V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1} = 15\text{ mA}, V_{BE(off)} = 0.5\text{ V}$	$t_r$	-	-	40	
Storage time $V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1}=I_{B2} = 15\text{ mA}$	$t_{stg}$	-	-	80	
Fall time $V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1}=I_{B2} = 15\text{ mA}$	$t_f$	-	-	30	

## Test circuits

### Delay and rise time

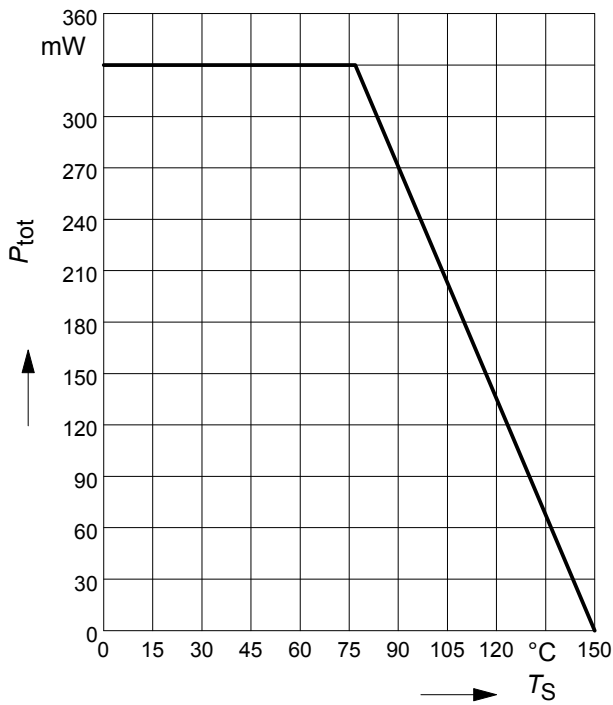


### Storage and fall time

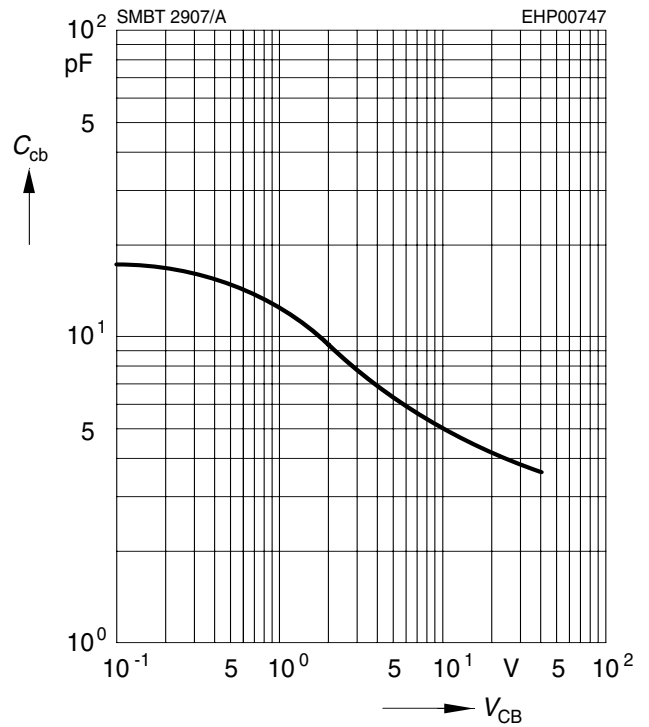


Oscilloscope:  $R > 100 \Omega$ ,  $C < 12 \text{ pF}$ ,  $t_r < 5 \text{ ns}$

**Total power dissipation  $P_{tot} = f(T_S)$**

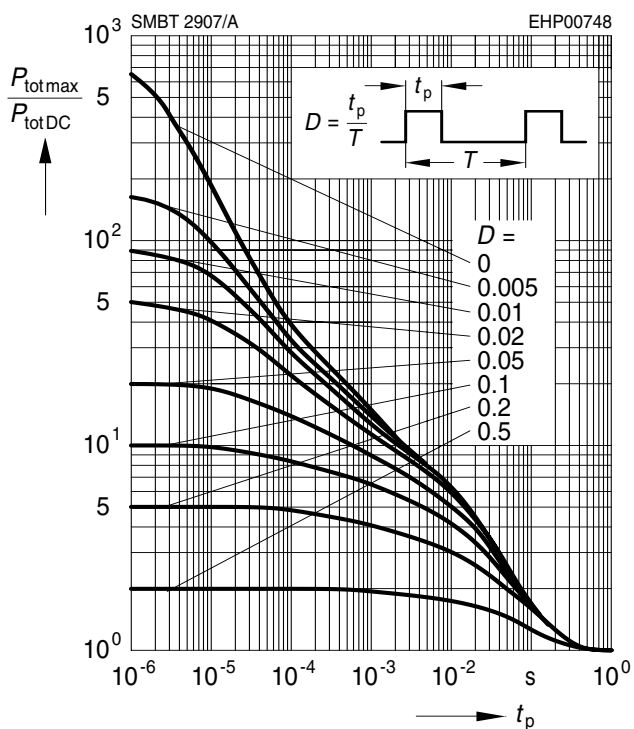


**Collector-base capacitance  $C_{CB} = f(V_{CB})$   
 $f = 1\text{MHz}$**



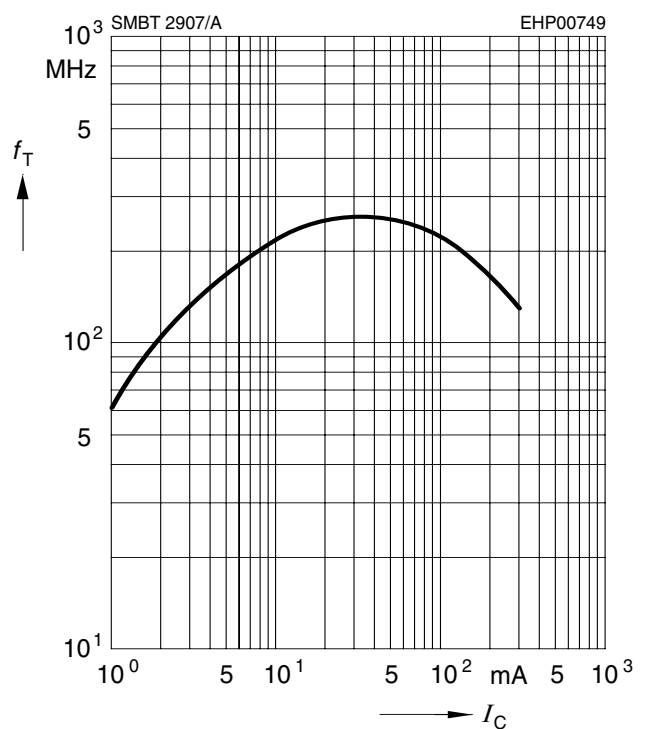
**Permissible pulse load**

$P_{totmax} / P_{totDC} = f(t_p)$



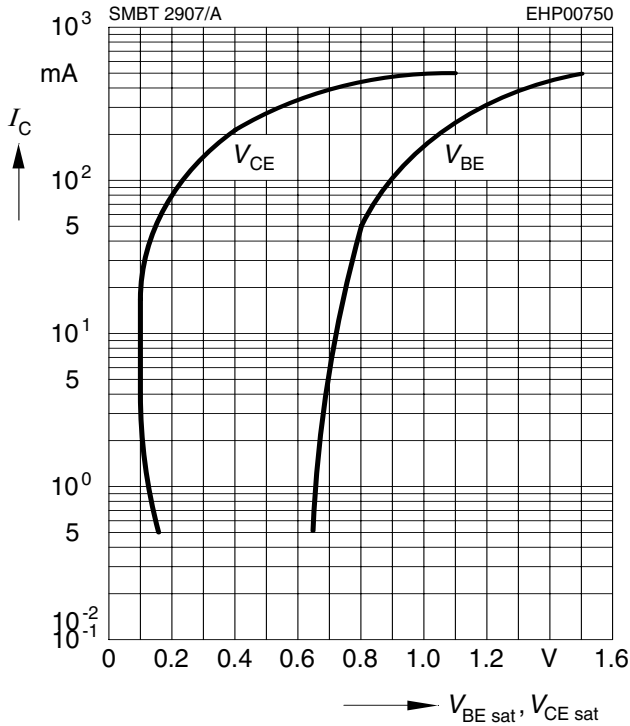
**Transition frequency  $f_T = f(I_C)$**

$V_{CE} = 5\text{V}$



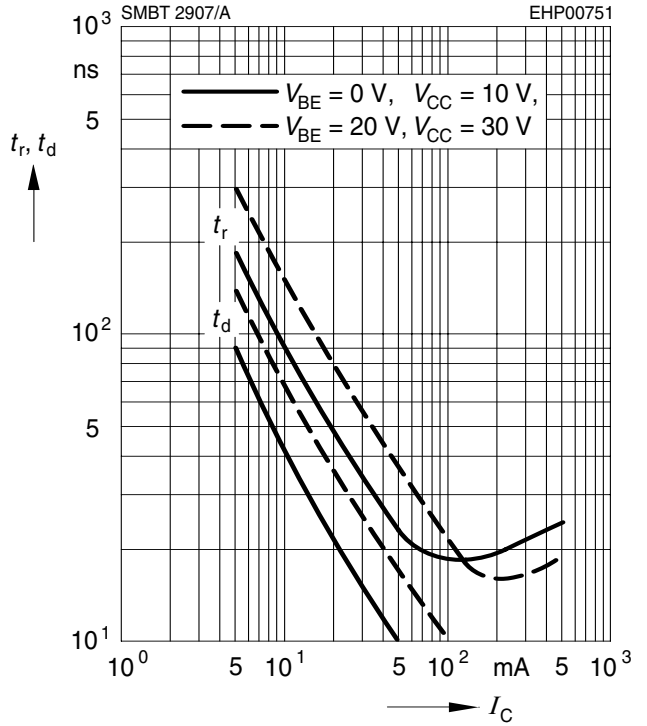
Saturation voltage  $I_C = f(V_{BEsat}, V_{CEsat})$

$h_{FE} = 10$

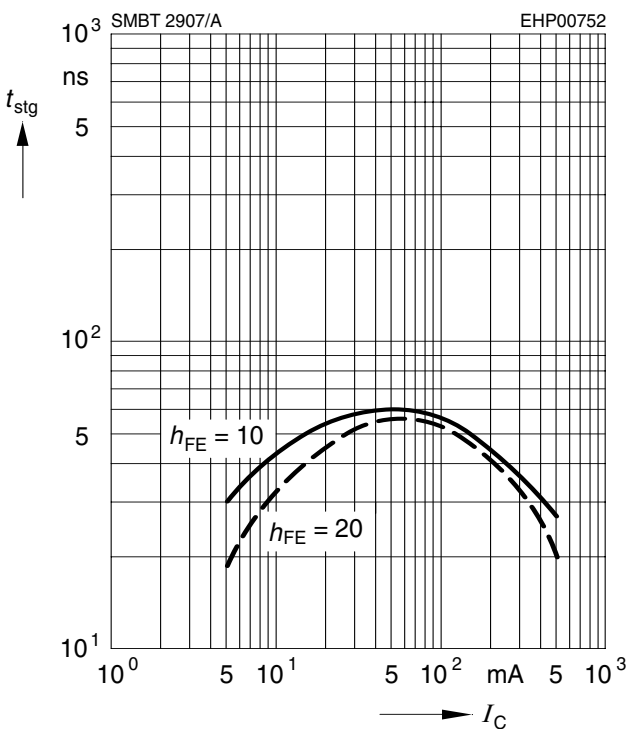


Delay time  $t_d = f(I_C)$

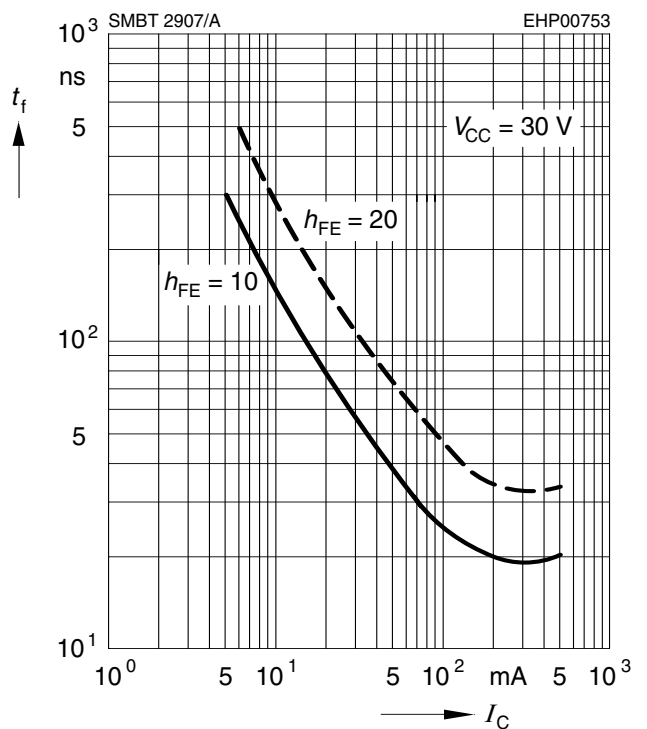
Rise time  $t_r = f(I_C)$



Storage time  $t_{stg} = f(I_C)$



Fall time  $t_f = f(I_C)$



DC current gain  $h_{FE} = f(I_C)$

$V_{CE} = 5V$

