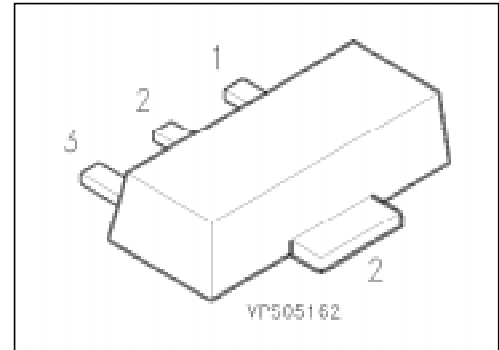


## NPN Silicon Switching Transistor

**SXT 3904**

- High current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage



Type	Marking	Ordering Code (tape and reel)	Pin Configuration			Package <sup>1)</sup>
			1	2	3	
SXT 3904	1A	Q68000-A8396	B	C	E	SOT-89

### Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	$V_{CE0}$	40	V
Collector-base voltage	$V_{CB0}$	60	
Emitter-base voltage	$V_{EB0}$	6	
Collector current	$I_C$	200	mA
Total power dissipation, $T_s = 95\text{ °C}$	$P_{tot}$	1	W
Junction temperature	$T_j$	150	°C
Storage temperature range	$T_{stg}$	- 65 ... + 150	

### Thermal Resistance

Junction - ambient <sup>2)</sup>	$R_{th\ JA}$	≤ 125	K/W
Junction - soldering point	$R_{th\ JS}$	≤ 55	

<sup>1)</sup> For detailed information see chapter Package Outlines.

<sup>2)</sup> Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm<sup>2</sup> Cu.

## Electrical Characteristics

at  $T_A = 25\text{ °C}$ , unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>DC characteristics</b>					
Collector-emitter breakdown voltage $I_C = 1\text{ mA}$	$V_{(BR)CE0}$	40	–	–	V
Collector-base breakdown voltage $I_C = 10\text{ }\mu\text{A}$	$V_{(BR)CB0}$	60	–	–	
Emitter-base breakdown voltage $I_E = 10\text{ }\mu\text{A}$	$V_{(BR)EB0}$	6	–	–	
Collector-base cutoff current $V_{CB} = 30\text{ V}$	$I_{CB0}$	–	–	50	nA
Collector-emitter cutoff current $V_{CE} = 30\text{ V}$ , $V_{BE} = 3\text{ V}$	$I_{CEV}$	–	–	50	
DC current gain $I_C = 100\text{ }\mu\text{A}$ , $V_{CE} = 1\text{ V}$ $I_C = 1\text{ mA}$ , $V_{CE} = 1\text{ V}$ $I_C = 10\text{ mA}$ , $V_{CE} = 1\text{ V}$ $I_C = 50\text{ mA}$ , $V_{CE} = 1\text{ V}$ $I_C = 100\text{ mA}$ , $V_{CE} = 1\text{ V}$	$h_{FE}$	40 70 100 60 30	– – – – –	– – 300 – –	–
Collector-emitter saturation voltage <sup>1)</sup> $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$ $I_C = 50\text{ mA}$ , $I_B = 5\text{ mA}$	$V_{CEsat}$	– –	– –	0.2 0.3	V
Base-emitter saturation voltage <sup>1)</sup> $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$ $I_C = 50\text{ mA}$ , $I_B = 5\text{ mA}$	$V_{BEsat}$	0.65 –	– –	0.85 0.95	

<sup>1)</sup> Pulse test conditions:  $t \leq 300\text{ }\mu\text{s}$ ,  $D \leq 2\%$ .

**Electrical Characteristics**

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

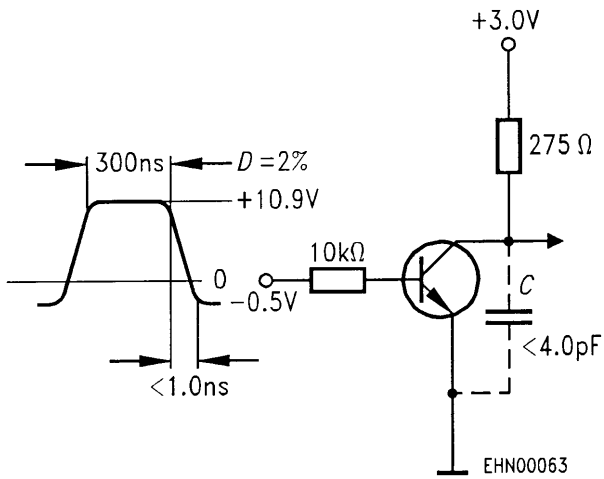
Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**AC characteristics**

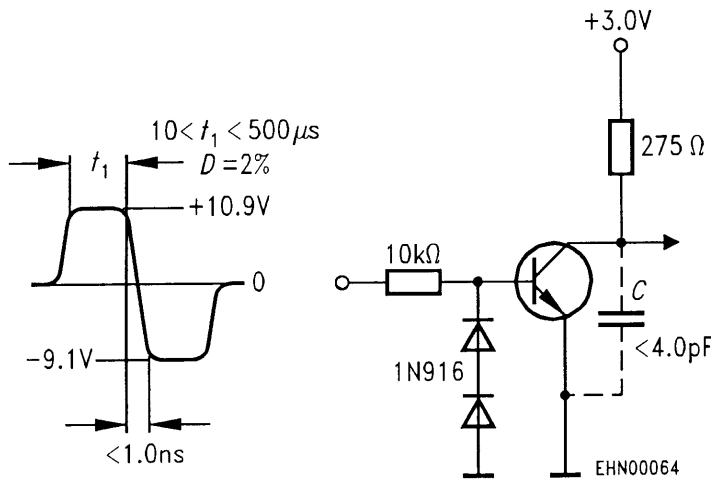
Transition frequency $I_C = 10\text{ mA}$ , $V_{CE} = 20\text{ V}$ , $f = 100\text{ MHz}$	$f_T$	300	–	–	MHz
Output capacitance $V_{CB} = 5\text{ V}$ , $f = 1\text{ MHz}$	$C_{obo}$	–	–	4	pF
Input capacitance $V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$	$C_{ibo}$	–	–	8	
Input impedance $I_C = 1\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1\text{ kHz}$	$h_{ie}$	1	–	10	k $\Omega$
Voltage feedback ratio $I_C = 1\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1\text{ kHz}$	$h_{re}$	0.5	–	8	$10^{-4}$
Small-signal current gain $I_C = 1\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1\text{ kHz}$	$h_{te}$	100	–	400	–
Output admittance $I_C = 1\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1\text{ kHz}$	$h_{oe}$	1	–	40	$\mu\text{S}$
Noise figure $I_C = 0.1\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 10\text{ Hz to }15\text{ kHz}$ $R_S = 1\text{ k}\Omega$	$NF$	–	–	5	dB
Switching times $V_{CC} = 3\text{ V}$ , $V_{BE} = 0.5\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = 1\text{ mA}$	$t_d$ $t_r$	–	–	35 35	ns ns
$V_{CC} = 3\text{ V}$ , $I_C = 10\text{ mA}$ , $I_{B1} = I_{B2} = 1\text{ mA}$	$t_s$ $t_f$	–	–	200 50	ns ns

Test circuits

Delay and rise time

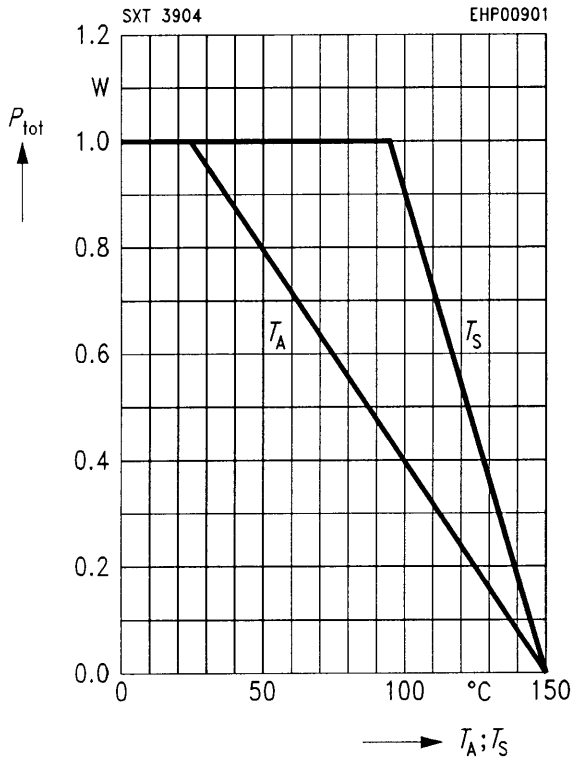


Storage and fall time

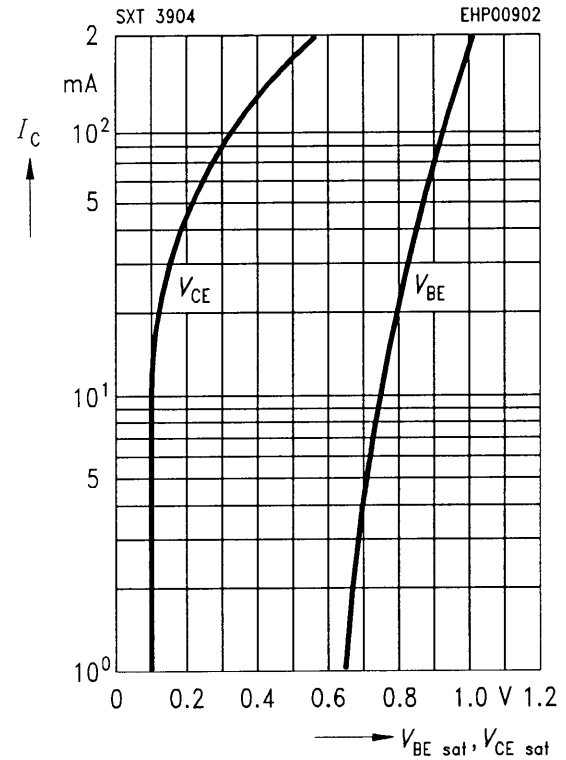


**Total power dissipation  $P_{tot} = f(T_A^*; T_S)$**

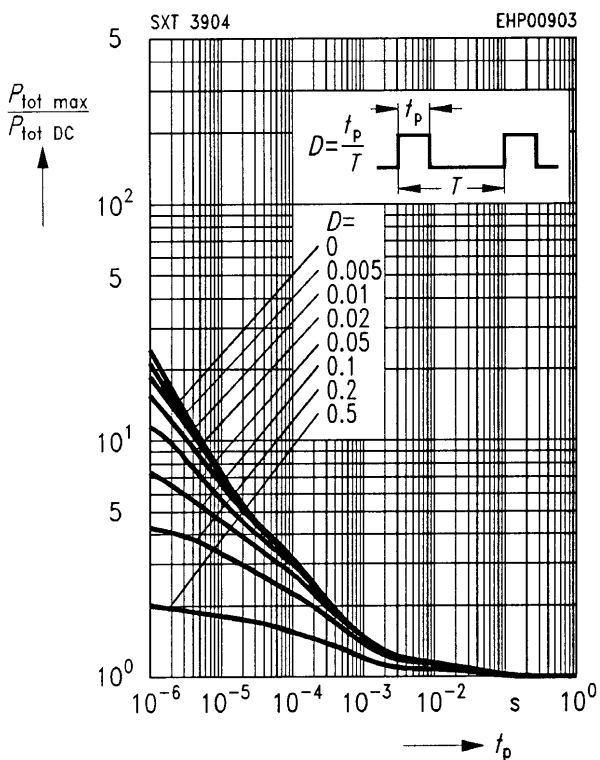
\* Package mounted on epoxy



**Saturation voltage  $I_C = f(V_{BE sat}, V_{CE sat})$**



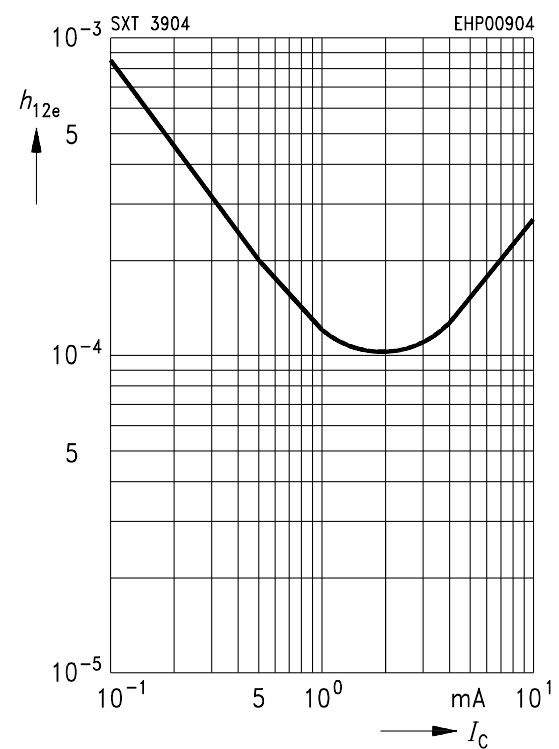
**Permissible pulse load  $P_{tot max}/P_{tot DC} = f(t_p)$**



**Open-circuit reverse voltage transfer ratio**

$h_{12e} = f(I_C)$

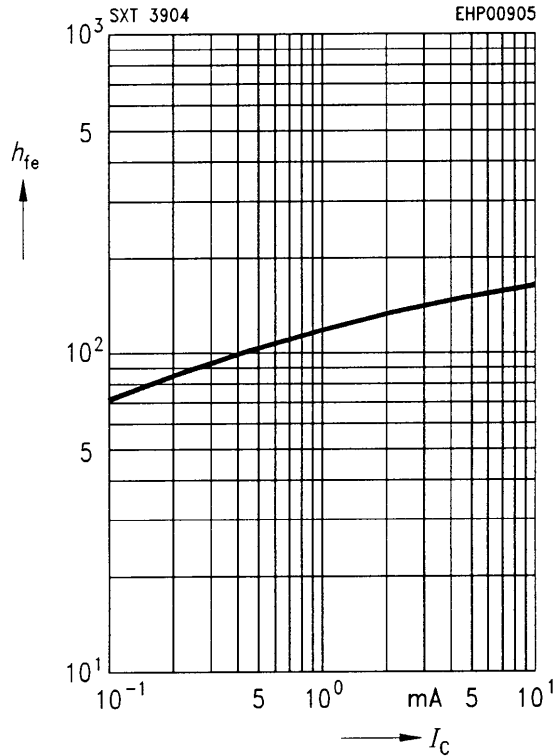
$V_{CE} = 10 V, f = 1 kHz$



**Small-signal current gain**

$h_{fe} = f(I_C)$

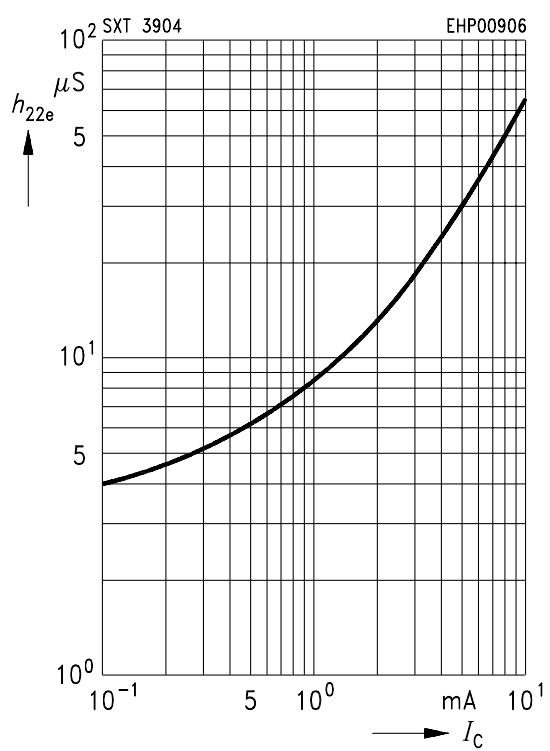
$V_{CE} = 10\text{ V}, f = 1\text{ MHz}$



**Output admittance**

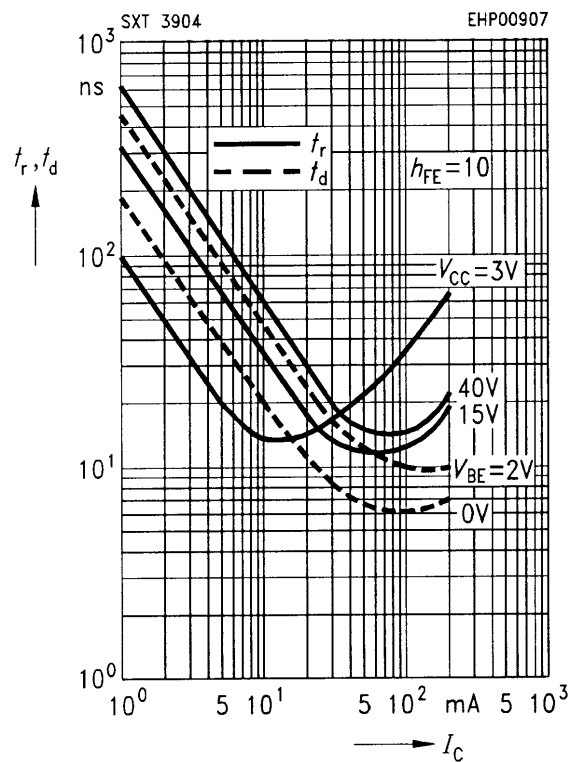
$h_{22e} = f(I_C)$

$V_{CE} = 10\text{ V}, f = 1\text{ MHz}$

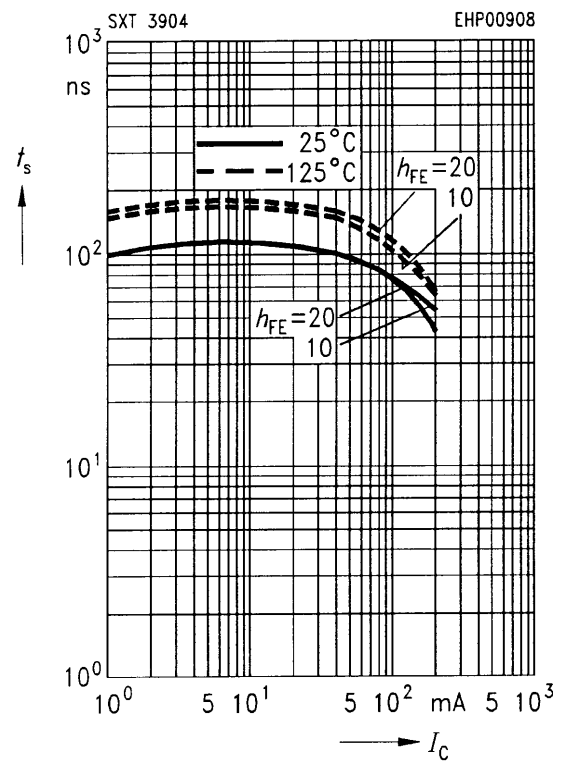


**Delay time  $t_d = f(I_C)$**

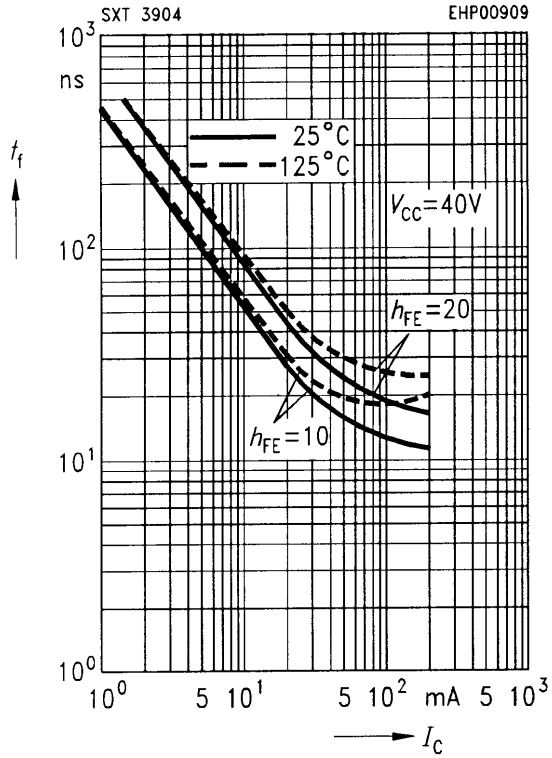
**Rise time  $t_r = f(I_C)$**



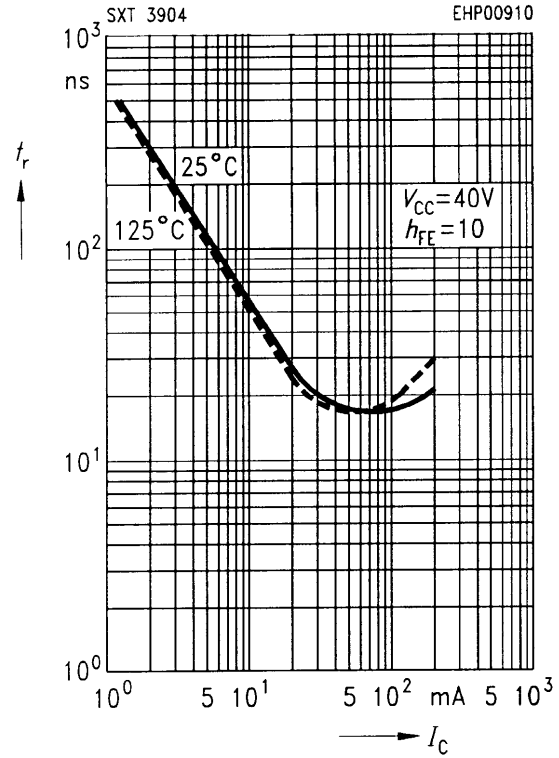
**Storage time  $t_s = f(I_C)$**



**Fall time  $t_f = f(I_c)$**



**Rise time  $t_r = f(I_c)$**



**DC current gain  $h_{FE} = f(I_c)$**   
 $V_{CE} = 1$  V (standardized)

