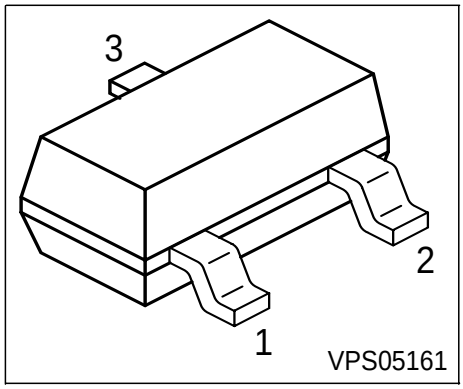
PNP Silicon Switching Transistor



- High DC current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage
- Complementary type:
  SMBT3904/ MMBT3904 (NPN)

Type	Marking	Pin Configuration			Package
SMBT3906/ MMBT3906	s2A	1 = B	2 = E	3 = C	SOT23

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	40	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	200	mA
Total power dissipation- T_S = 71 °C	P_{tot}	330	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[1)]	R_{thJS}	≤240	K/W

[1]For calculation of R_{thJA} please refer to Application Note Thermal Resistance

Electrical Characteristics at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage I_C = 1 mA, I_B = 0	$V_{(BR)CEO}$	40	-	-	V
Collector-base breakdown voltage I_C = 10 µA, I_E = 0	$V_{(BR)CBO}$	40	-	-	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	5	-	-	
Collector-base cutoff current V_{CB} = 30 V, I_E = 0	I_{CBO}	-	-	50	nA
DC current gain[1)]	h_{FE}				-
I_C = 100 µA, V_{CE} = 1 V		60	-	-	
I_C = 1 mA, V_{CE} = 1 V		80	-	-	
I_C = 10 mA, V_{CE} = 1 V		100	-	300	
I_C = 50 mA, V_{CE} = 1 V		60	-	-	
I_C = 100 mA, V_{CE} = 1 V		30	-	-	
Collector-emitter saturation voltage[1)]	V_{CEsat}				V
I_C = 10 mA, I_B = 1 mA		-	-	0.25	
I_C = 50 mA, I_B = 5 mA		-	-	0.4	
Base emitter saturation voltage-[1)]	V_{BEsat}				
I_C = 10 mA, I_B = 1 mA		0.65	-	0.85	
I_C = 50 mA, I_B = 5 mA		-	-	0.95	

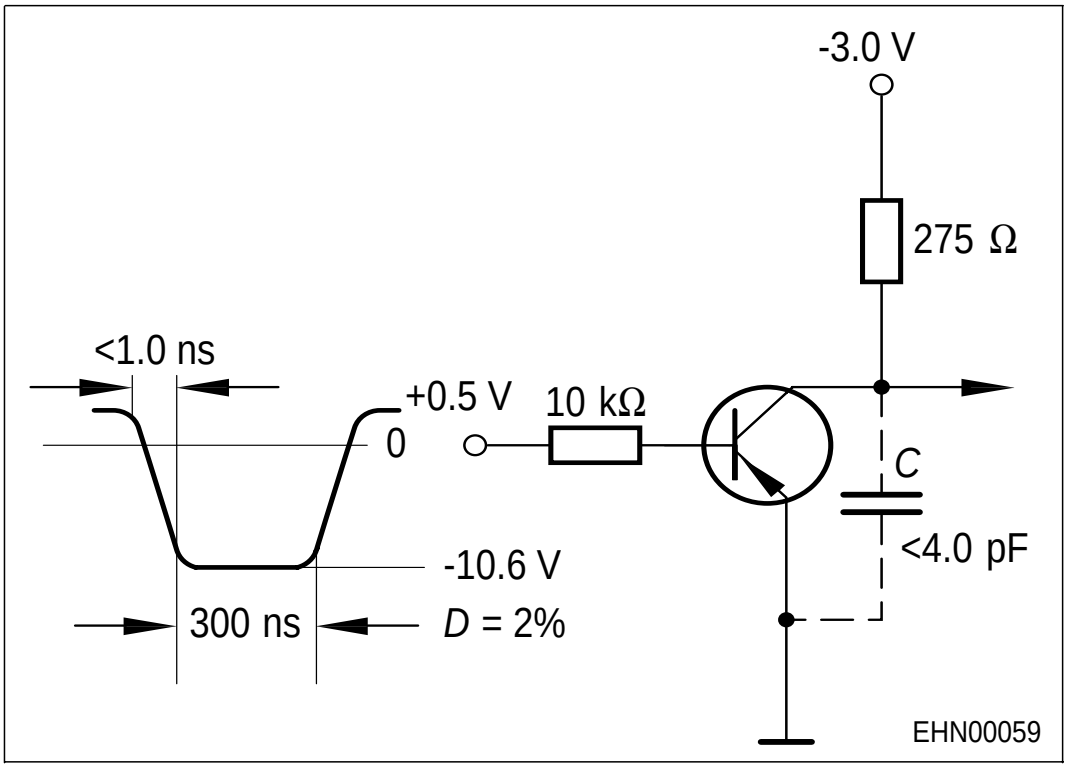
[1]Puls test: t ≤ 300µs, D = 2%

AC Characteristics

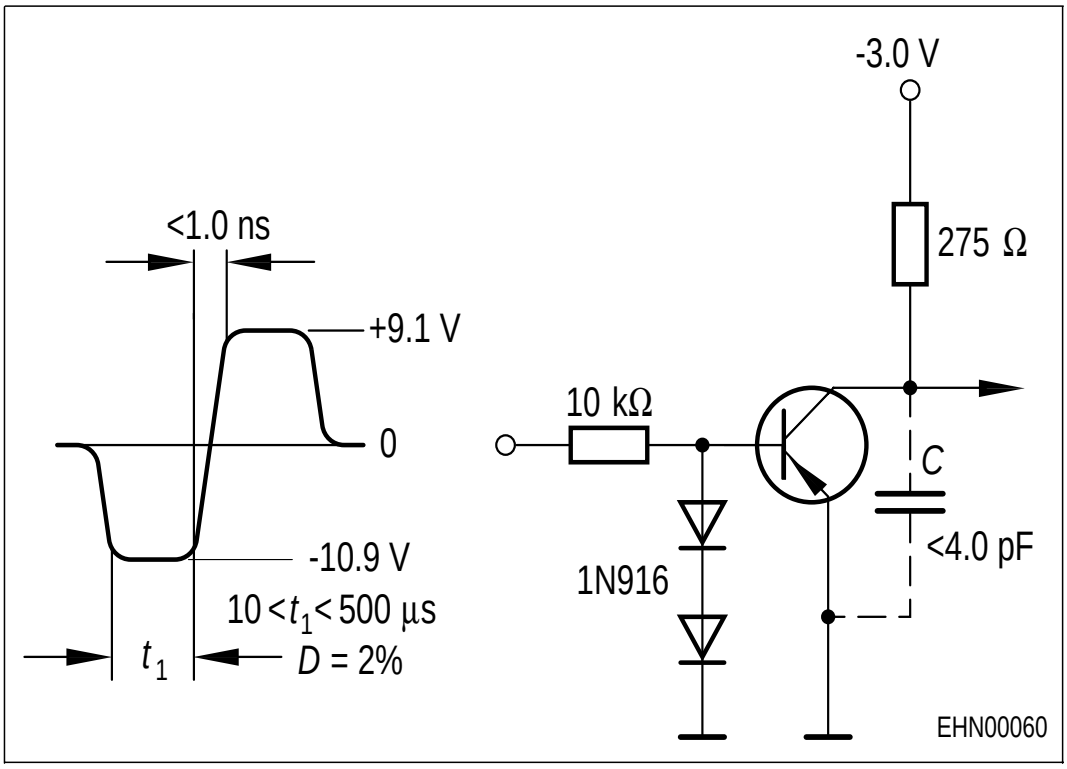
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	250	-	-	MHz
Collector-base capacitance V_{CB} = 5 V, f = 1 MHz	C_{cb}	-	-	4.5	pF
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	-	10	
Short-circuit input impedance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{11e}	2	-	12	kΩ
Open-circuit reverse voltage transf. ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{12e}	0.1	-	10	10^{-4}
Short-circuit forward current transf. ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{21e}	100	-	400	-
Open-circuit output admittance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{22e}	3	-	60	µS
Delay time V_{CC} = 3 V, I_C = 10 mA, I_{B1} = 1 mA, $V_{BE(off)}$ = 0.5 V	t_d	-	-	35	ns
Rise time V_{CC} = 3 V, I_C = 10 mA, I_{B1} = 1 mA, $V_{BE(off)}$ = 0.5 V	t_r	-	-	35	
Storage time V_{CC} = 3 V, I_C = 10 mA, I_{B1} = I_{B2} = 1mA	t_{stg}	-	-	225	
Fall time V_{CC} = 3 V, I_C = 10 mA, I_{B1} = I_{B2} = 1mA	t_f	-	-	75	
Noise figure I_C = 100 µA, V_{CE} = 5 V, f = 1 kHz, Δ f = 200 Hz, R_S = 1 kΩ	F	-	-	4	dB

Test circuit

Delay and rise time

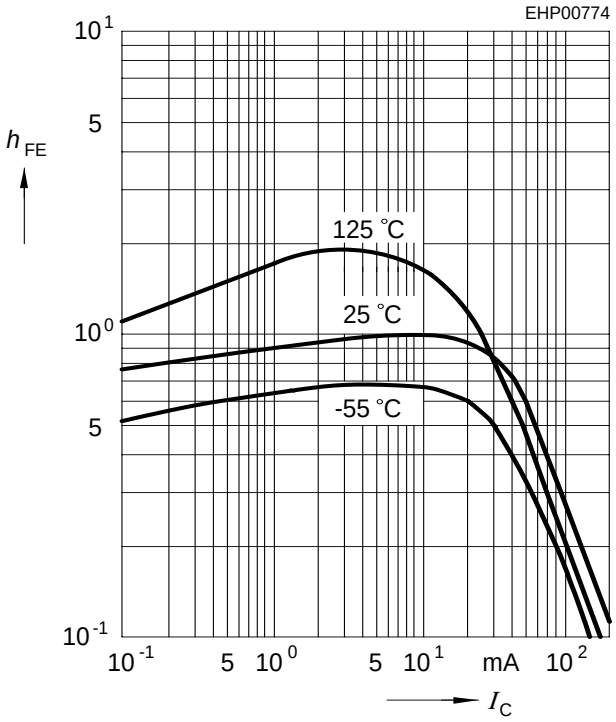


Storage and fall time



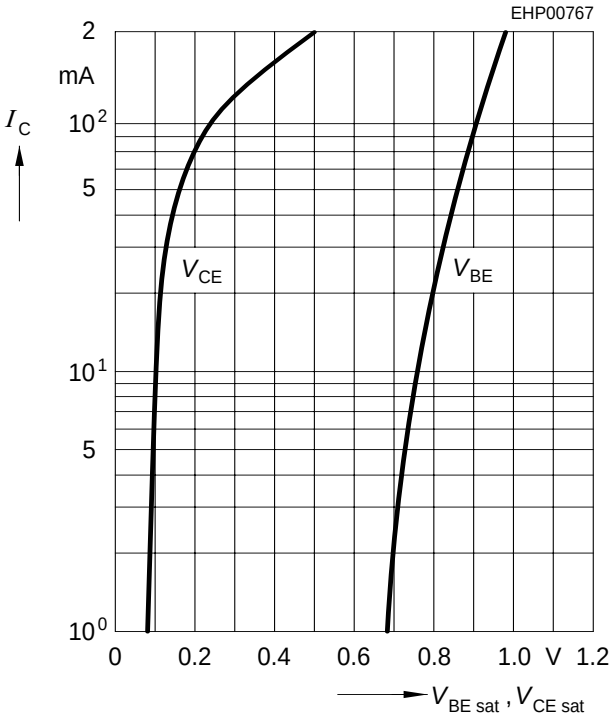
DC current gain $h_{FE} = f(I_C)$

V_{CE} = 1 V, normalized



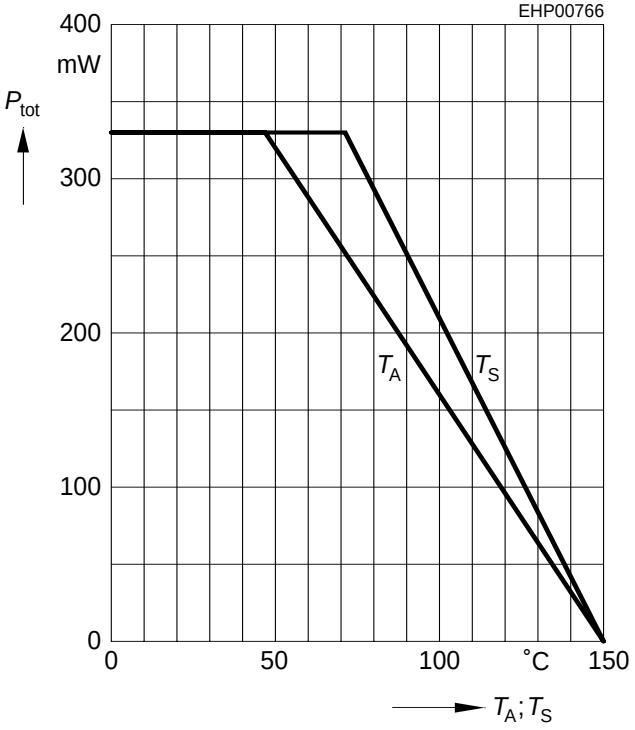
Saturation voltage $I_C = f(V_{BEsat}; V_{CEsat})$

h_{FE} = 10



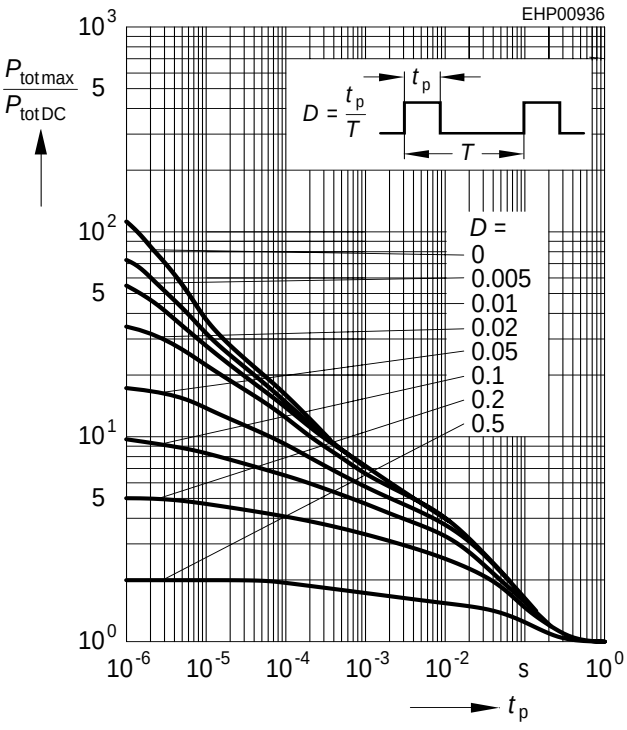
Total power dissipation $P_{tot} = f(T_A^*; T_S)$

* Package mounted on epoxy



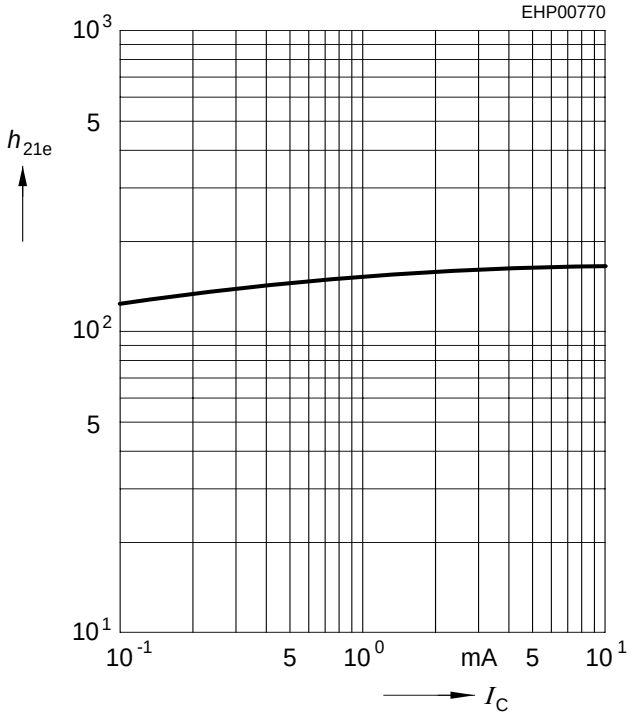
Permissible Pulse Load

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



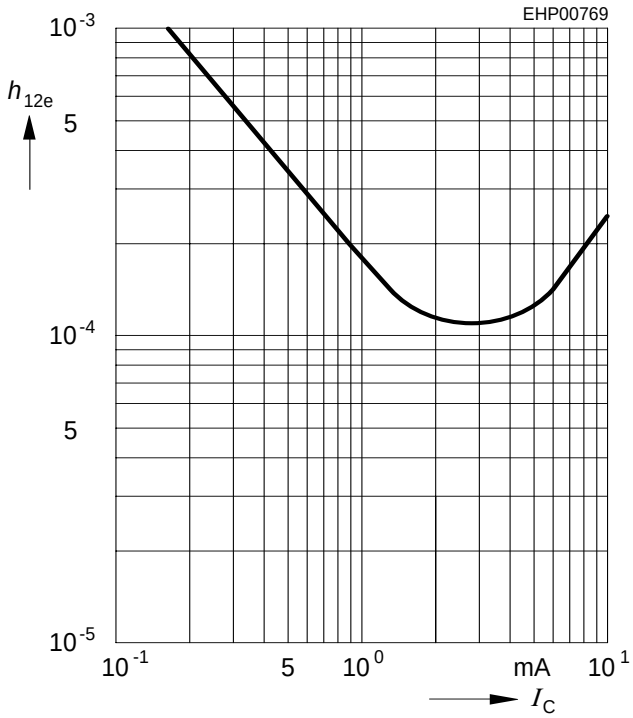
Short-circuit forward current transfer ratio $h_{21e} = f(I_C)$

V_{CE} = 10V, f = 1MHz



Open-circuit reverse voltage transfer ratio $h_{12e} = f(I_C)$

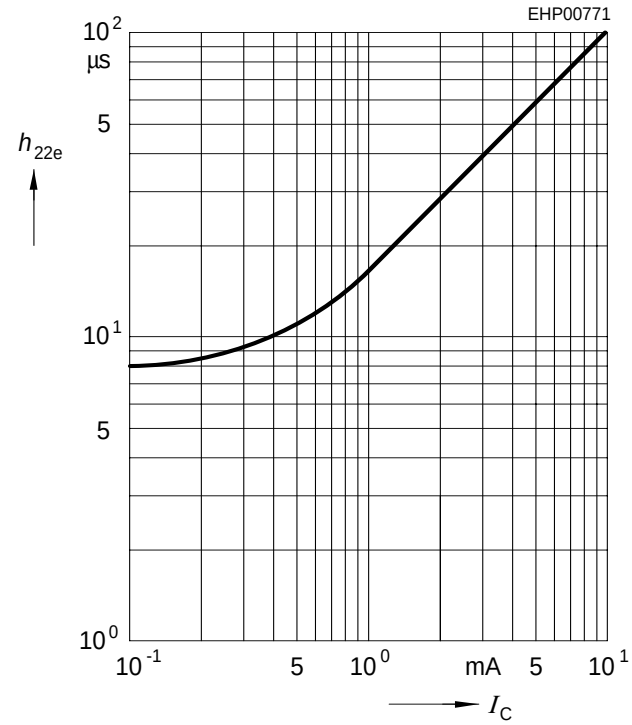
V_{CE} = 10V, f = 1kHz



Open-circuit output admittance

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

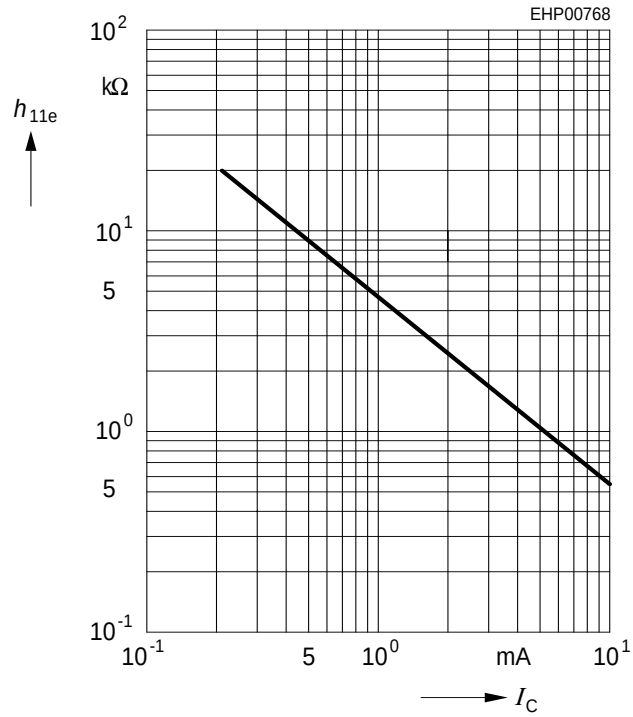
V_{CE} = 10V, f = 1MHz



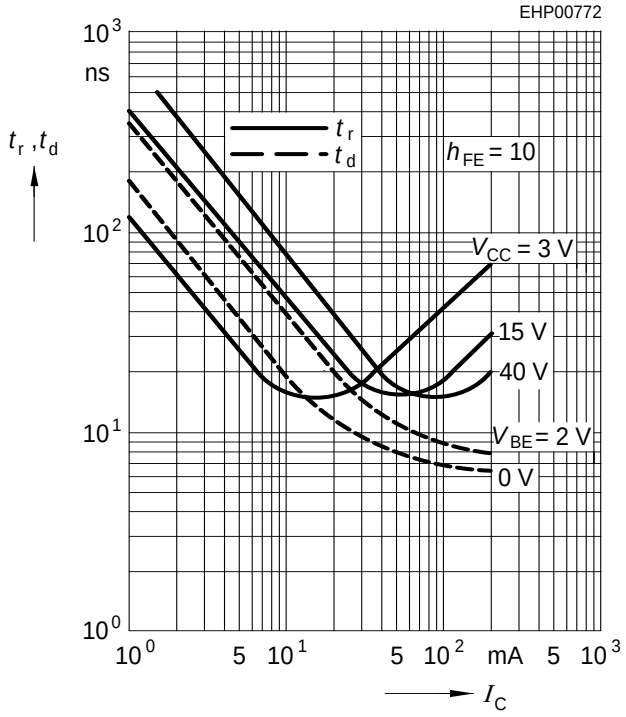
Input impedance

$h_{11e} = f(I_C)$

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



Delay time t_d = $f(I_C)$
Rise time t_r = $f(I_C)$



Fall time t_f = $f(I_C)$