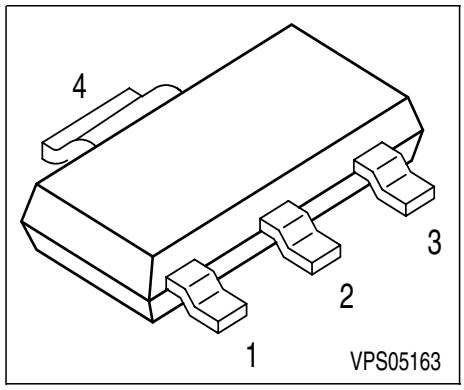
NPN Silicon Switching Transistor

- High DC current gain: 0.1mA to 100mA
- Low collector-emitter saturation voltage
- Complementary type: PZT 3906 (PNP)



Type	Marking	Pin Configuration				Package
PZT 3904	ZT 3904	1 = B	2 = C	3 = E	4 = C	SOT-223

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	60	
Emitter-base voltage	V_{EBO}	6	
DC collector current	I_C	200	mA
Total power dissipation, T_S = 72 °C	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Junction ambient 1)	R_{thJA}	≤122	K/W
Junction - soldering point	R_{thJS}	≤52	

1) Package mounted on pcb 40mm x 40mm x 1.5mm / 6cm^2 Cu

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_B = 0	$V_{(BR)CBO}$	60	-	-	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	6	-	-	
Collector cutoff current V_{CB} = 30 V, I_E = 0	I_{CBO}	-	-	50	nA
Collector-emitter cutoff current V_{CE} = 30 V, -V_{BE} = 0.5 V	I_{CEV}	-	-	50	
Base-emitter cutoff current V_{CE} = 30 V, -V_{BE} = 0.5	I_{BEV}	-	-	50	
DC current gain 1) I_C = 0.1 mA, V_{CE} = 1 V I_C = 1 mA, V_{CE} = 1 V I_C = 10 mA, V_{CE} = 1 V I_C = 50 mA, V_{CE} = 1 V I_C = 100 mA, V_{CE} = 1 V	h_{FE}	 40 70 100 60 30	 - - - - -	 - - 300 - -	-
Collector-emitter saturation voltage1) I_C = 10 mA, I_B = 1 mA I_C = 50 mA, I_B = 5 mA	V_{CEsat}	 - -	 - -	 0.2 0.3	V
Base-emitter saturation voltage 1) I_C = 100 mA, I_B = 1 mA I_C = 50 mA, I_B = 5 mA	V_{BEsat}	 - -	 - -	 0.85 0.9	

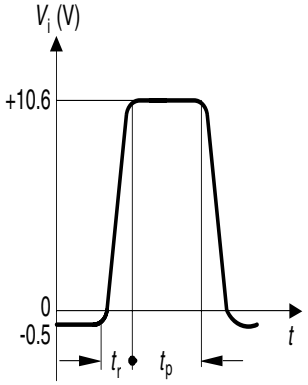
1) Pulse test: t ≤ 300µs, D = 2%

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

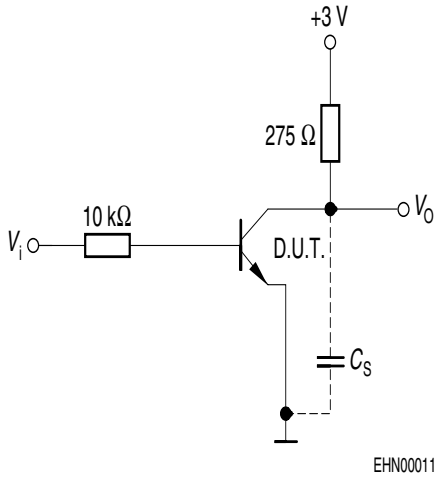
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Transition frequency I_C = 10 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	-	-	MHz
Collector-base capacitance V_{CB} = 5 V, f = 1 MHz	C_{cb}	-	-	4	pF
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	-	8	
Noise figure I_C = 100 µA, V_{CE} = 5 V, R_S = 1 kΩ, f = 10Hz to 15.7kHz,	F	-	-	5	dB
Short-circuit input impedance I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{11e}	1	-	10	kΩ
Open-circuit reverse voltage transf.ratio I_C = 1 mA, V_{CE} = 10 V, f = 1 kHz	h_{12e}	0.5	-	8	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}	1	-	40	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}	-	-	200	
Fall time V_{CC} = 3 V, I_C = 10 mA, I_{B1}=I_{B2} = 1mA	t_f	-	-	50	

Switching Times

Turn-on time when switched from + V_{BEoff} = 0.5B to - V_{BEon} = 10.6V, - I_{Con} = 10mA - I_{Bon} = 1mA

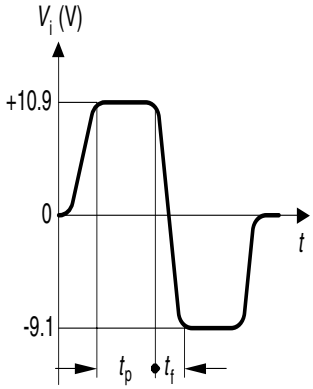


Input waveform; t_r < 1ns; t_p = 300 ns
δ = 0.002

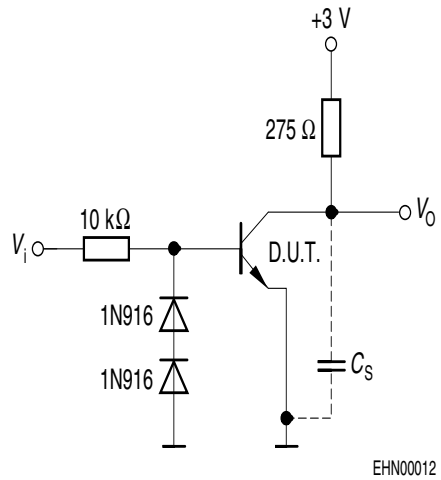


Delay and rise time test circuit; total shunt capacitance of test jig and connectors C_s < 4pF; scope impedance = 10MΩ

Turn-off time I_{Con} = 10mA; I_{Bon} = 1mA



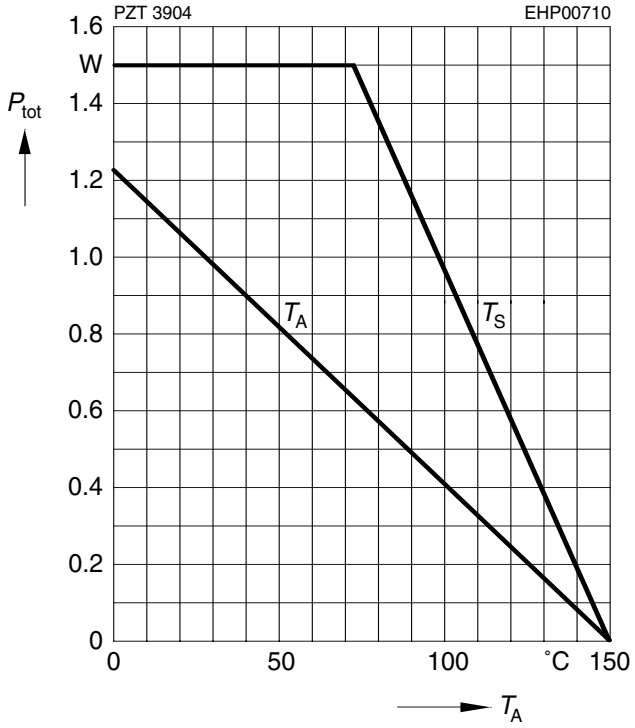
Input waveform; t_r < 1ns; 10 µs < t_p ≤ 500 µs
δ = 0.02



Storage and fall time test circuit; total shunt capacitance of test jig and connectors C_s < 4pF; scope impedance = 10MΩ

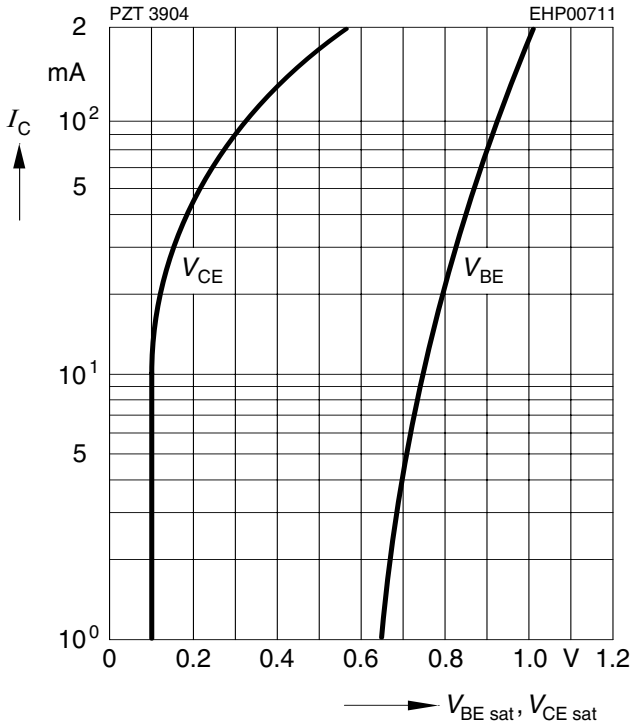
Total power dissipation $P_{tot} = f(T_A^*; T_S)$

* Package mounted on epoxy



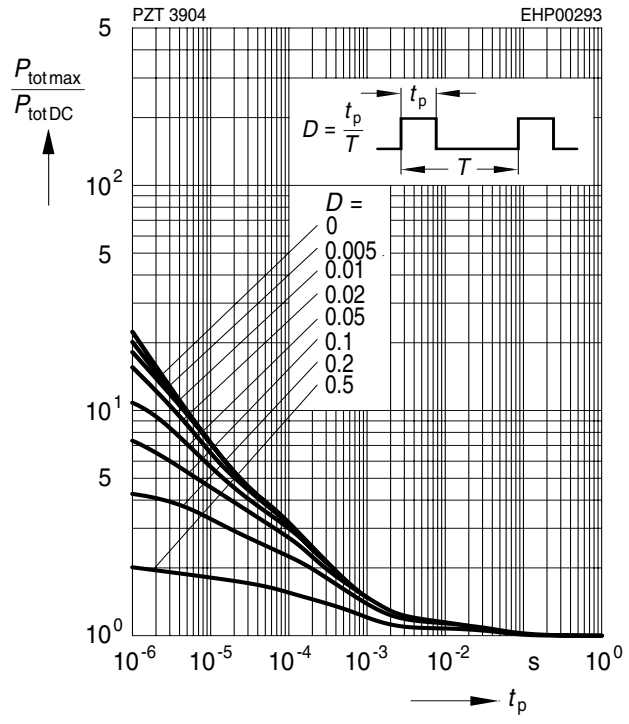
Saturation voltage $I_C = f(V_{BEsat}, V_{CEsat})$

$h_{FE} = 10$



Permissible pulse load

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



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

V_{CE} = 10V, normalized