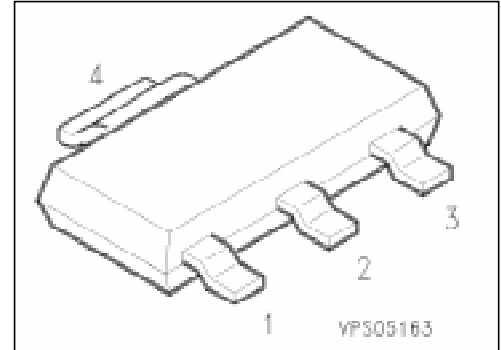


NPN Silicon Switching Transistor

PZT 3904

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



Type	Marking	Ordering Code (tape and reel)	Pin Configuration				Package ¹⁾
			1	2	3	4	
PZT 3904	ZT 3904	Q62702-Z2029	B	C	E	C	SOT-223

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, $T_s = 72\text{ °C}$	P_{tot}	1.5	W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	- 65 ... + 150	

Thermal Resistance

Junction - ambient ²⁾	$R_{th\ JA}$	≤ 122	K/W
Junction - soldering point	$R_{th\ JS}$	≤ 52	

¹⁾ For detailed information see chapter Package Outlines.

²⁾ Package mounted on epoxy pcb 40 mm × 40 mm × 1.5 mm/6 cm² Cu.

Electrical Characteristics

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

DC characteristics

Collector-emitter breakdown voltage $I_C = 1\text{ mA}, I_B = 0$	$V_{(BR)CE0}$	40	–	–	V
Collector-base breakdown voltage $I_C = 10\text{ }\mu\text{A}, I_B = 0$	$V_{(BR)CB0}$	60	–	–	
Emitter-base breakdown voltage $I_E = 10\text{ }\mu\text{A}, I_C = 0$	$V_{(BR)EB0}$	6	–	–	
Collector-base cutoff current $V_{CB} = 30\text{ V}, I_E = 0$	I_{CB0}	–	–	50	nA
Collector-emitter cutoff current $V_{CE} = 30\text{ V}, -V_{BE} = 0.5\text{ V}$	I_{CEV}	–	–	50	
Base-emitter cutoff current $V_{CE} = 30\text{ V}, -V_{BE} = 0.5\text{ V}$	I_{BEV}	–	–	50	
DC current gain ¹⁾ $I_C = 0.1\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 1\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 50\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 100\text{ mA}, V_{CE} = 1\text{ V}$	h_{FE}	40 70 100 60 30	– – – – –	– – 300 – –	–
Collector-emitter saturation voltage ¹⁾ $I_C = 10\text{ mA}, I_B = 1\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5\text{ mA}$	V_{CEsat}	– –	– –	0.2 0.3	V
Base-emitter saturation voltage ¹⁾ $I_C = 10\text{ mA}, I_C = 1\text{ mA}$ $I_C = 50\text{ mA}, I_C = 5\text{ mA}$	V_{BEsat}	– –	– –	0.85 0.95	

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

Electrical Characteristics

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

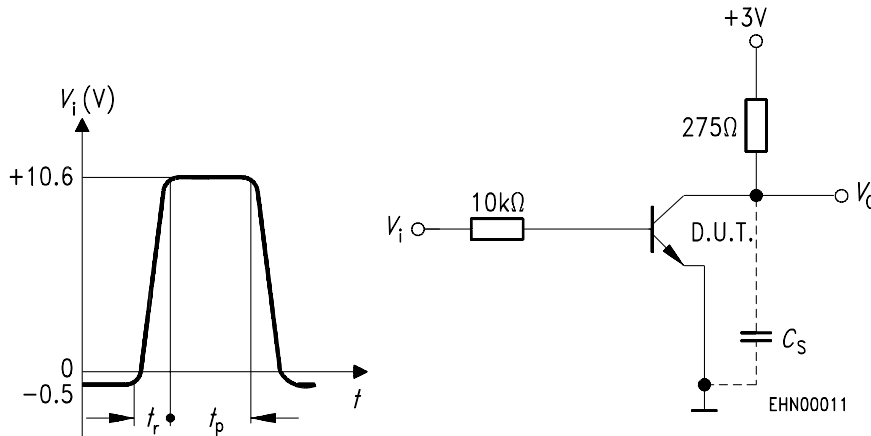
Parameter	Symbol	Values			Unit
		min.	typ.	max.	

AC characteristics

Transition frequency $I_C = 10\text{ mA}$, $V_{CE} = 20\text{ V}$, $f = 100\text{ MHz}$	f_T	300	–	–	MHz
Collector-base 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	
Noise figure $I_C = 100\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, $R_S = 1\text{ k}\Omega$, $f = 10\text{ Hz}$ to 15.7 kHz	F	–	–	5	dB
Input impedance $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$	h_{11e}	1	–	10	$\text{k}\Omega$
Open-circuit reverse voltage transfer ratio $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$	h_{12e}	0.5	–	8	10^{-4}
Short-circuit forward current transfer ratio $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$	h_{21e}	100	–	400	–
Open-circuit output admittance $I_C = 1\text{ mA}$, $V_{CE} = 10\text{ V}$, $f = 1\text{ kHz}$	h_{22e}	1	–	40	μS
$V_{CC} = 3\text{ V}$, $I_C = 10\text{ mA}$, $I_{B1} = 1\text{ mA}$ $V_{BE(\text{off})} = 0.5\text{ V}$					
Delay time	t_d	–	–	35	ns
Rise time	t_r	–	–	35	ns
$V_{CC} = 3\text{ V}$, $I_C = 10\text{ mA}$, $I_{B1} = I_{B2} = 1\text{ mA}$					
Storage time	t_{stg}	–	–	200	ns
Fall time (see diagrams)	t_f	–	–	50	ns

Switching Times

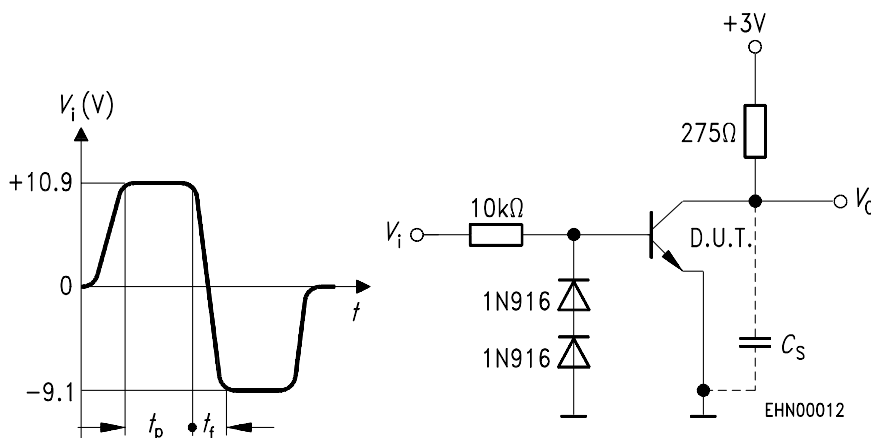
Turn-on time when switched from $-V_{BEoff} = 0.5\text{ V}$ to $V_{BEon} = 10.6\text{ V}$, $I_{Con} = 10\text{ mA}$; $I_{Bon} = 1\text{ mA}$



Input waveform; $t_r < 1\text{ ns}$; $t_p = 300\text{ ns}$;
 $\delta = 0.02$.

Delay and rise time test circuit; total shunt capacitance of test jig and connectors $C_s < 4\text{ pF}$; scope impedance = $10\text{ M}\Omega$.

Turn-off time $I_{Con} = 10\text{ mA}$; $I_{Bon} = -I_{Boff} = 1\text{ mA}$

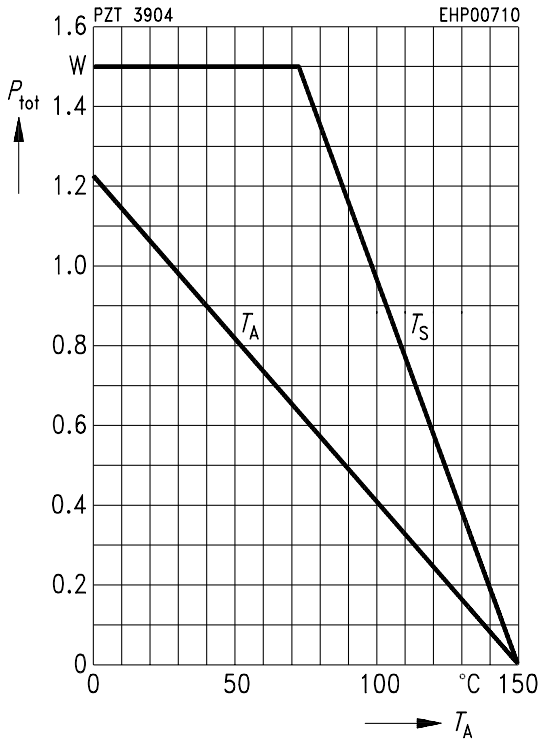


Input waveform; $t_i < 1\text{ ns}$; $10\text{ }\mu\text{s} < t_p \leq 500\text{ }\mu\text{s}$;
 $\delta = 0.02$.

Storage and fall time test circuit; total shunt capacitance of test jig and connectors $C_s < 4\text{ pF}$; scope impedance = $10\text{ M}\Omega$.

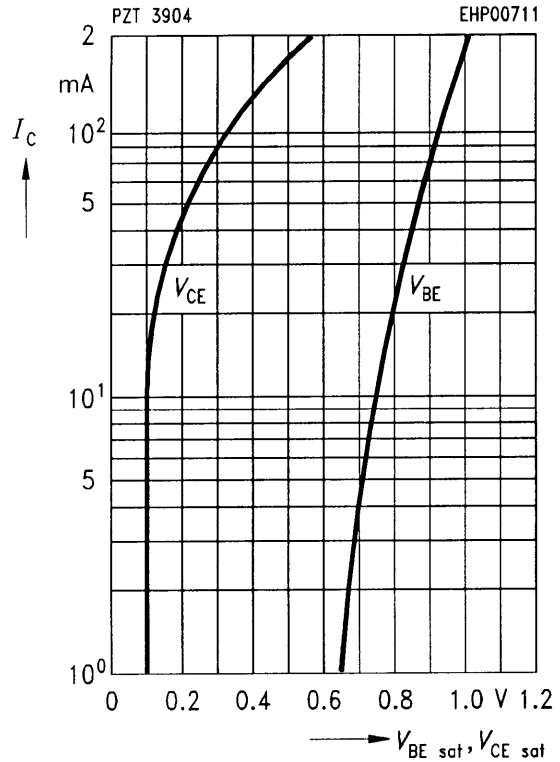
Total power dissipation $P_{tot} = f(T_A^*; T_S)$

* Package mounted on epoxy



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

$h_{FE} = 10$



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

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

$V_{CE} = 10 V$, normalized

