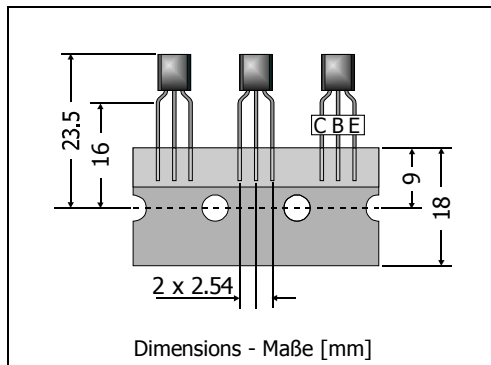


2N3904**NPN**
Si-Epitaxial-Planar Switching Transistors
Si-Epitaxial-Planar Schalttransistoren
NPN

Version 2010-02-09


 Power dissipation
 Verlustleistung

625 mW

 Plastic case
 Kunststoffgehäuse

 TO-92
 (10D3)

Weight approx. – Gewicht ca.

0.18 g

 Plastic material has UL classification 94V-0
 Gehäusematerial UL94V-0 klassifiziert

 Standard packaging taped in ammo pack
 Standard Lieferform gegurtet in Ammo-Pack
**Maximum ratings (T_A = 25°C)****Grenzwerte (T_A = 25°C)**

			2N3904
Collector-Emitter-volt. – Kollektor-Emitter-Spannung	B open	V _{CEO}	40 V
Collector-Base-voltage – Kollektor-Basis-Spannung	E open	V _{CBO}	60 V
Emitter-Base-voltage – Emitter-Basis-Spannung	C open	V _{EBO}	6 V
Power dissipation – Verlustleistung		P _{tot}	625 mW ¹⁾
Collector current – Kollektorstrom (dc)		I _C	200 mA
Junction temperature – Sperrschichttemperatur		T _j	-55...+150°C
Storage temperature – Lagerungstemperatur		T _S	-55...+150°C

Characteristics (T_j = 25°C)**Kennwerte (T_j = 25°C)**

		Min.	Typ.	Max.
DC current gain – Kollektor-Basis-Stromverhältnis ²⁾				
I _C = 0.1 mA, V _{CE} = 1 V	h _{FE}	4070	–	–
I _C = 1 mA, V _{CE} = 1 V	h _{FE}	100	–	–
I _C = 10 mA, V _{CE} = 1 V	h _{FE}	60	–	300
I _C = 50 mA, V _{CE} = 1 V	h _{FE}	30	–	–
I _C = 100 mA, V _{CE} = 1 V	h _{FE}	–	–	–
h-Parameters at/bei V _{CE} = 10 V, - I _C = 1 mA, f = 1 kHz				
Small signal current gain – Kleinsignal-Stromverstärkung	h _{fe}	100	–	400
Input impedance – Eingangs-Impedanz	h _{ie}	1 kΩ	–	10 kΩ
Output admittance – Ausgangs-Leitwert	h _{oe}	1 μS	–	40 μS
Reverse voltage transfer ratio – Spannungsrückwirkung	h _{re}	0.5*10 ⁻⁴	–	8*10 ⁻⁴

1 Mounted on P.C. board with 3 mm² copper pad at each terminal
 Montage auf Leiterplatte mit 3 mm² Kupferbelag (Löt-pad) an jedem Anschluss

2 Tested with pulses t_p = 300 μs, duty cycle ≤ 2% – Gemessen mit Impulsen t_p = 300 μs, Schaltverhältnis ≤ 2%

Characteristics ($T_j = 25^\circ\text{C}$)
Kennwerte ($T_j = 25^\circ\text{C}$)

		Min.	Typ.	Max.
Collector-Emitter saturation voltage – Kollektor-Sättigungsspannung ²⁾				
$I_C = 10\text{ mA}, I_B = 1\text{ mA}$	V_{CEsat}	–	–	0.2 V
$I_C = 50\text{ mA}, I_B = 5\text{ mA}$	V_{CEsat}	–	–	0.3 V
Base-Emitter saturation voltage – Basis-Sättigungsspannung ²⁾				
$I_C = 10\text{ mA}, I_B = 1\text{ mA}$	V_{BEsat}	0.65 V	–	0.65 V
$I_C = 50\text{ mA}, I_B = 5\text{ mA}$	V_{BEsat}	–	–	0.95 V
Collector-Base cutoff current – Kollektor-Basis-Reststrom				
$V_{CE} = 30\text{ V}, V_{EB} = 3\text{ V}$	I_{CBX}	–	–	50 nA
Emitter-Base cutoff current – Emitter-Basis-Reststrom				
$- V_{CE} = 30\text{ V}, - V_{EB} = 3\text{ V}$	I_{EBV}	–	---	50 nA
Gain-Bandwidth Product – Transitfrequenz				
$I_C = 10\text{ mA}, V_{CE} = 20\text{ V}, f = 100\text{ MHz}$	f_T	300 MHz	–	–
Collector-Base Capacitance – Kollektor-Basis-Kapazität				
$V_{CB} = 5\text{ V}, I_E = i_e = 0, f = 1\text{ MHz}$	C_{CBO}	–	–	4 pF
Emitter-Base Capacitance – Emitter-Basis-Kapazität				
$V_{EB} = 0.5\text{ V}, I_C = i_c = 0, f = 1\text{ MHz}$	C_{EBO}	–	–	8 pf
Noise figure – Rauschzahl				
$V_{CE} = 5\text{ V}, I_C = 1\text{ }\mu\text{A}, R_G = 1\text{ k}\Omega, f = 1\text{ kHz}$	F	–	–	5 dB
Switching times – Schaltzeiten (between 10% and 90% levels)				
delay time	$V_{CC} = 3\text{ V}, V_{BE} = 0.5\text{ V}$	t_d	–	–
rise time	$I_C = 10\text{ mA}, I_{B1} = 1\text{ mA}$	t_r	–	–
storage time	$V_{CC} = 3\text{ V}, I_C = 10\text{ mA},$	t_s	–	–
fall time	$I_{B1} = I_{B2} = 1\text{ mA}$	t_f	–	–
Thermal resistance junction to ambient air Wärmewiderstand Sperrschicht – umgebende Luft		R_{thA}	< 200 K/W ¹⁾	
Recommended complementary PNP transistors Empfohlene komplementäre PNP-Transistoren		2N3906		

2 Tested with pulses $t_p = 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$ – Gemessen mit Impulsen $t_p = 300\text{ }\mu\text{s}$, Schaltverhältnis $\leq 2\%$

1 Mounted on P.C. board with 3 mm^2 copper pad at each terminal
Montage auf Leiterplatte mit 3 mm^2 Kupferbelag (Lötpad) an jedem Anschluss