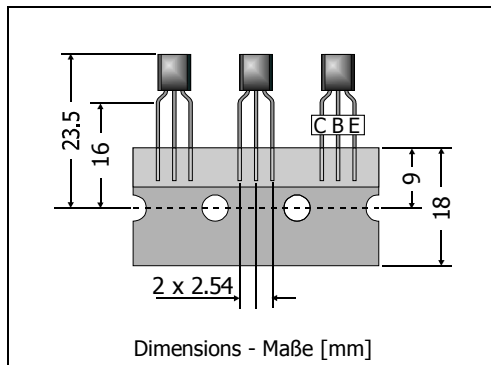


2N3904**NPN**
Si-Epitaxial-Planar Switching Transistors
Si-Epitaxial-Planar Schalttransistoren
NPN

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 mA, I _B = 1 mA	V _{CEsat}	–	–	0.2 V
I _C = 50 mA, I _B = 5 mA	V _{CEsat}	–	–	0.3 V
Base-Emitter saturation voltage – Basis-Sättigungsspannung ²⁾				
I _C = 10 mA, I _B = 1 mA	V _{BEsat}	0.65 V	–	0.65 V
I _C = 50 mA, I _B = 5 mA	V _{BEsat}	–	–	0.95 V
Collector-Base cutoff current – Kollektor-Basis-Reststrom				
V _{CE} = 30 V, V _{EB} = 3 V	I _{CBX}	–	–	50 nA
Emitter-Base cutoff current – Emitter-Basis-Reststrom				
- V _{CE} = 30 V, - V _{EB} = 3 V	I _{EBV}	–	–	50 nA
Gain-Bandwidth Product – Transitfrequenz				
I _C = 10 mA, V _{CE} = 20 V, f = 100 MHz	f _T	300 MHz	–	–
Collector-Base Capacitance – Kollektor-Basis-Kapazität				
V _{CB} = 5 V, I _E = i _e = 0, f = 1 MHz	C _{CBO}	–	–	4 pF
Emitter-Base Capacitance – Emitter-Basis-Kapazität				
V _{EB} = 0.5 V, I _C = i _c = 0, f = 1 MHz	C _{EBO}	–	–	8 pf
Noise figure – Rauschzahl				
V _{CE} = 5 V, I _C = 1 µA, R _G = 1 kΩ, f = 1 kHz	F	–	–	5 dB
Switching times – Schaltzeiten (between 10% and 90% levels)				
delay time	V _{CC} = 3 V, V _{BE} = 0.5 V	t _d	–	–
rise time	I _C = 10 mA, I _{B1} = 1mA	t _r	–	–
storage time	V _{CC} = 3 V, I _C = 10 mA,	t _s	–	–
fall time	I _{B1} = I _{B2} = 1 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