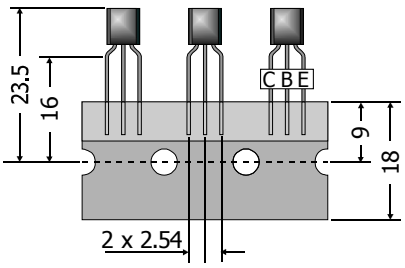
Diotec Semiconductor

2N3904

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

Version 2010-02-09



Dimensions - Maße [mm]

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 Storage temperature – Lagerungstemperatur		T_j T_S	-55...+150°C -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 (Lötpad) 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°C) **Kennwerte (T_j = 25°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, I_C = 10 mA, I_{B1} = 1mA)	t_d	–	–	35 ns
rise time (V_{CC} = 3 V, V_{BE} = 0.5 V, I_C = 10 mA, I_{B1} = 1mA)	t_r	–	–	35 ns
storage time (V_{CC} = 3 V, I_C = 10 mA, I_{B1} = I_{B2} = 1 mA)	t_s	–	–	200 ns
fall time (V_{CC} = 3 V, I_C = 10 mA, I_{B1} = I_{B2} = 1 mA)	t_f	–	–	50 ns
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 µs, duty cycle ≤ 2% – Gemessen mit Impulsen t_p = 300 µs, Schaltverhältnis ≤ 2%

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

