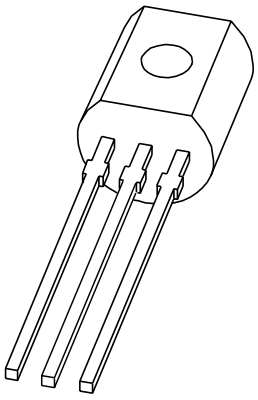
DATA SHEET



2N3906
PNP switching transistor

Product specification
Supersedes data of 1999 Apr 23

2004 Oct 11

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PNP switching transistor 2N3906

FEATURES

- Low current (max. 200 mA)
- Low voltage (max. 40 V).

APPLICATIONS

- High-speed switching in industrial applications.

DESCRIPTION

PNP switching transistor in a TO-92; SOT54 plastic package. NPN complement: 2N3904.

PINNING

PIN	DESCRIPTION
1	collector
2	base
3	emitter

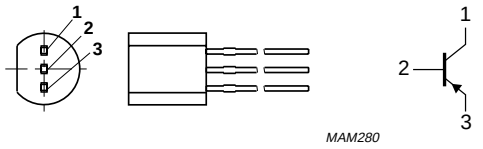


Fig.1 Simplified outline (TO-92; SOT54) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
2N3906	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–40	V
V_{CEO}	collector-emitter voltage	open base	–	–40	V
V_{EBO}	emitter-base voltage	open collector	–	–6	V
I_C	collector current (DC)		–	–200	mA
I_{CM}	peak collector current		–	–300	mA
I_{BM}	peak base current		–	–100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	500	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	ambient temperature		–65	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	note 1	250	K/W

Note

1. Transistor mounted on an FR4 printed-circuit board.

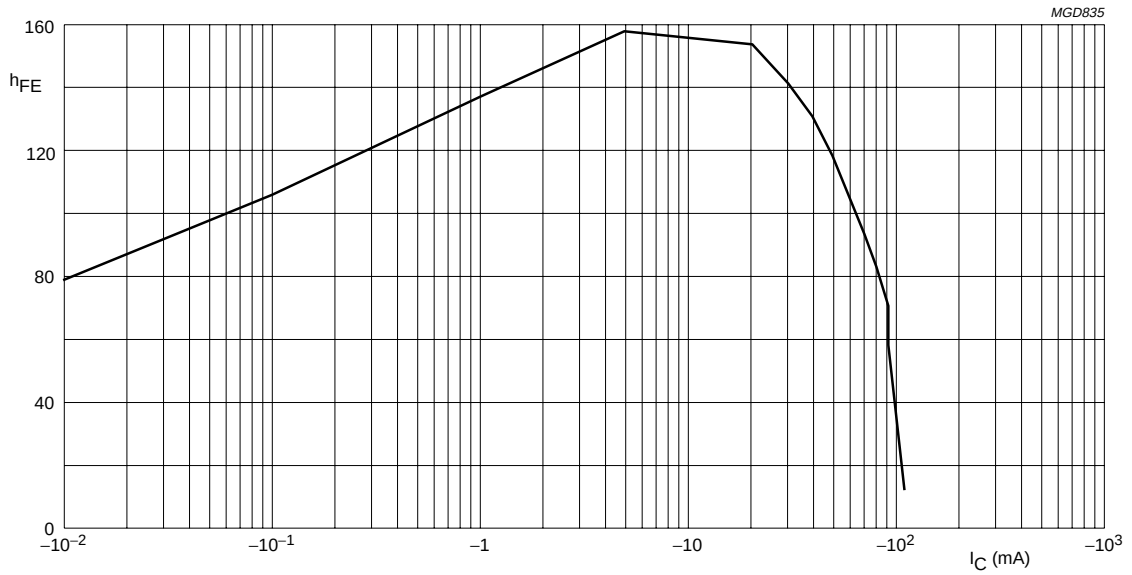
CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector-base cut-off current	V_{CB} = –30 V; I_E = 0 A	–	–50	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = –6 V; I_C = 0 A	–	–50	nA
h_{FE}	DC current gain	V_{CE} = –1 V; note 1; see Fig.2			
		I_C = –0.1 mA	60	–	
		I_C = –1 mA	80	–	
		I_C = –10 mA	100	300	
		I_C = –50 mA	60	–	
		I_C = –100 mA	30	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = –10 mA; I_B = –1 mA; note 1	–	–200	mV
		I_C = –50 mA; I_B = –5 mA; note 1	–	–200	mV
V_{BEsat}	base-emitter saturation voltage	I_C = –10 mA; I_B = –1 mA; note 1	–	–850	mV
		I_C = –50 mA; I_B = –5 mA; note 1	–	–950	mV
C_c	collector capacitance	V_{CB} = –5 V; I_E = i_e = 0 A; f = 1 MHz	–	4.5	pF
C_e	emitter capacitance	I_C = i_c = 0; V_{EB} = –500 mV; f = 1 MHz	–	10	pF
f_T	transition frequency	V_{CE} = –20 V; I_C = –10 mA; f = 100 MHz	250	–	MHz
F	noise figure	V_{CE} = –5 V; I_C = –100 μA; R_S = 1 kΩ; f = 10 Hz to 15.7 kHz	–	4	dB
Switching times (between 10 % and 90 % levels); see Fig.3					
t_{on}	turn-on time	I_{Con} = –10 mA; I_{Bon} = –1 mA; I_{Boff} = 1 mA	–	65	ns
t_d	delay time		–	35	ns
t_r	rise time		–	35	ns
t_{off}	turn-off time		–	300	ns
t_s	storage time		–	225	ns
t_f	fall time		–	75	ns

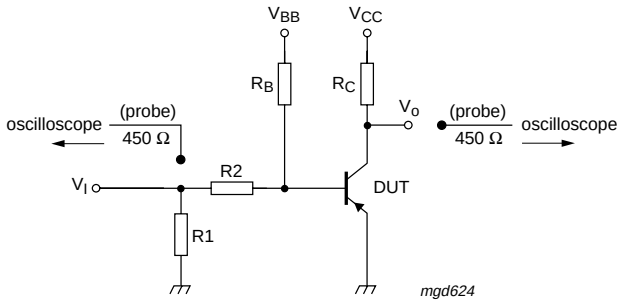
Note

1. Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.



V_{CE} = 1 V.

Fig.2 DC current gain; typical values.

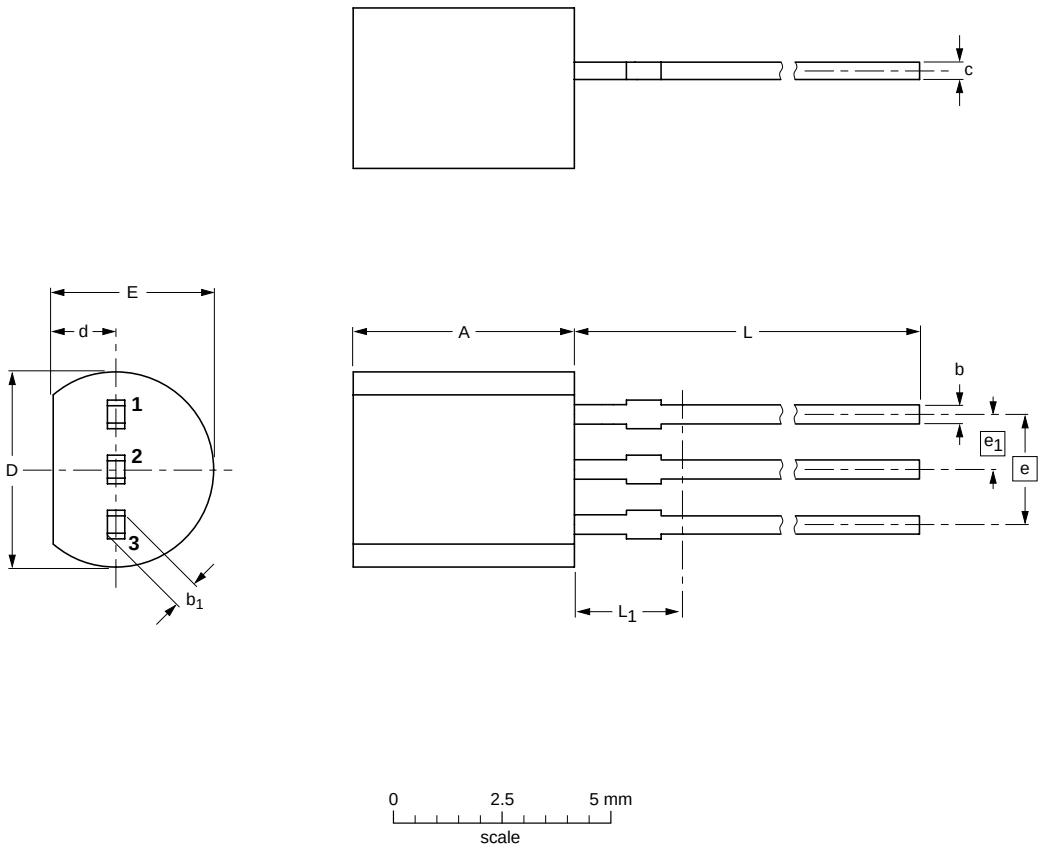


V_i = −5 V; T = 500 µs; t_p = 10 µs; t_r = t_f ≤ 3 ns.
R1 = 56 Ω; R2 = 2.5 kΩ; R_B = 3.9 kΩ; R_C = 270 Ω.
V_{BB} = 1.9 V; V_{CC} = −3 V.
Oscilloscope input impedance Z_i = 50 Ω.

Fig.3 Test circuit for switching times.

PACKAGE OUTLINE

Plastic single-ended leaded (through hole) package; 3 leads **SOT54**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b_1	c	D	d	E	e	e_1	L	L_1(1) max.
mm	5.2 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT54		TO-92	SC-43A			~~97-02-28~~ 04-06-28

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LEVEL	DATA SHEET STATUS[1]	PRODUCT STATUS[2][3]	DEFINITION
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