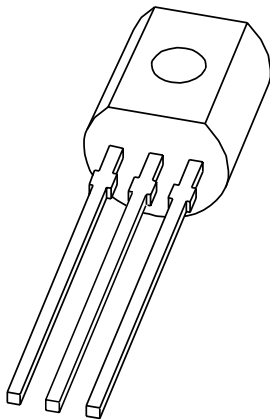


DATA SHEET



2N3906 PNP switching transistor

Product specification
Supersedes data of 1999 Apr 23

2004 Oct 11

PNP switching transistor

2N3906

FEATURES

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

APPLICATIONS

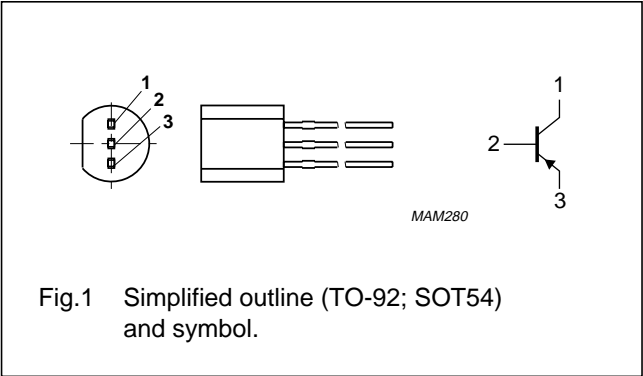
- High-speed switching in industrial applications.

DESCRIPTION

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

PINNING

PIN	DESCRIPTION
1	collector
2	base
3	emitter



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	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	–	500	mW
T_{stg}	storage temperature		–65	+150	$^{\circ}\text{C}$
T_j	junction temperature		–	150	$^{\circ}\text{C}$
T_{amb}	ambient temperature		–65	+150	$^{\circ}\text{C}$

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.

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CHARACTERISTICS

 $T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector-base cut-off current	$V_{\text{CB}} = -30\text{ V}$; $I_{\text{E}} = 0\text{ A}$	–	–50	nA
I_{EBO}	emitter-base cut-off current	$V_{\text{EB}} = -6\text{ V}$; $I_{\text{C}} = 0\text{ A}$	–	–50	nA
h_{FE}	DC current gain	$V_{\text{CE}} = -1\text{ V}$; note 1; see Fig.2 $I_{\text{C}} = -0.1\text{ mA}$ $I_{\text{C}} = -1\text{ mA}$ $I_{\text{C}} = -10\text{ mA}$ $I_{\text{C}} = -50\text{ mA}$ $I_{\text{C}} = -100\text{ mA}$	60 80 100 60 30	– – 300 – –	
V_{CEsat}	collector-emitter saturation voltage	$I_{\text{C}} = -10\text{ mA}$; $I_{\text{B}} = -1\text{ mA}$; note 1	–	–200	mV
		$I_{\text{C}} = -50\text{ mA}$; $I_{\text{B}} = -5\text{ mA}$; note 1	–	–200	mV
V_{BEsat}	base-emitter saturation voltage	$I_{\text{C}} = -10\text{ mA}$; $I_{\text{B}} = -1\text{ mA}$; note 1	–	–850	mV
		$I_{\text{C}} = -50\text{ mA}$; $I_{\text{B}} = -5\text{ mA}$; note 1	–	–950	mV
C_{c}	collector capacitance	$V_{\text{CB}} = -5\text{ V}$; $I_{\text{E}} = i_{\text{e}} = 0\text{ A}$; $f = 1\text{ MHz}$	–	4.5	pF
C_{e}	emitter capacitance	$I_{\text{C}} = i_{\text{c}} = 0$; $V_{\text{EB}} = -500\text{ mV}$; $f = 1\text{ MHz}$	–	10	pF
f_{T}	transition frequency	$V_{\text{CE}} = -20\text{ V}$; $I_{\text{C}} = -10\text{ mA}$; $f = 100\text{ MHz}$	250	–	MHz
F	noise figure	$V_{\text{CE}} = -5\text{ V}$; $I_{\text{C}} = -100\text{ }\mu\text{A}$; $R_{\text{S}} = 1\text{ k}\Omega$; $f = 10\text{ Hz to }15.7\text{ kHz}$	–	4	dB
Switching times (between 10 % and 90 % levels); see Fig.3					
t_{on}	turn-on time	$I_{\text{Con}} = -10\text{ mA}$; $I_{\text{Bon}} = -1\text{ mA}$; $I_{\text{Boff}} = 1\text{ mA}$	–	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: $t_{\text{p}} \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$.

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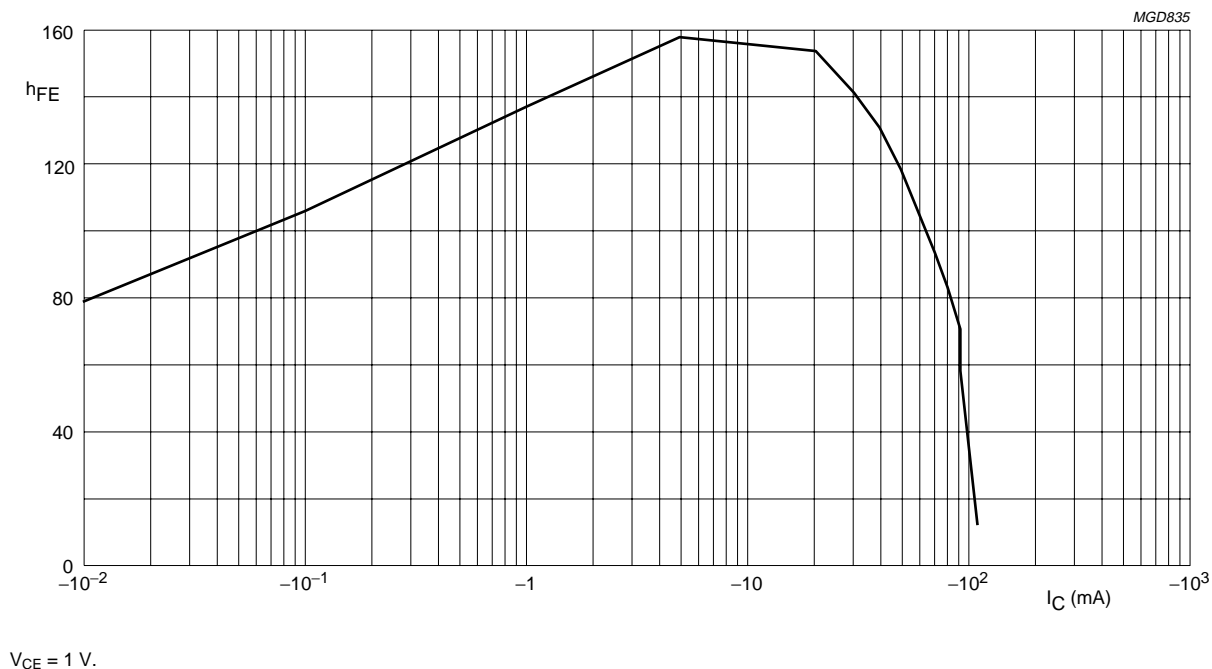
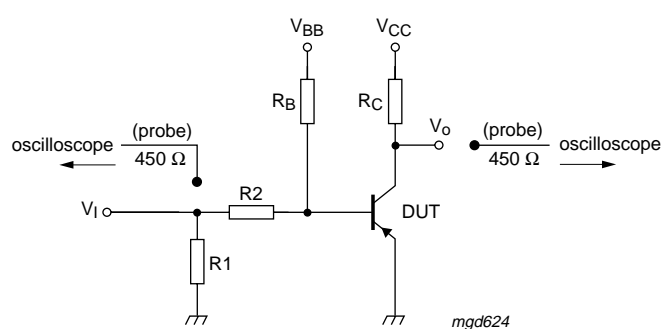


Fig.2 DC current gain; typical values.



$V_I = -5$ V; $T = 500$ μ s; $t_p = 10$ μ s; $t_r = t_f \leq 3$ ns.
 $R_1 = 56$ Ω ; $R_2 = 2.5$ k Ω ; $R_B = 3.9$ k Ω ; $R_C = 270$ Ω .
 $V_{BB} = 1.9$ V; $V_{CC} = -3$ V.
 Oscilloscope input impedance $Z_i = 50$ Ω .

Fig.3 Test circuit for switching times.

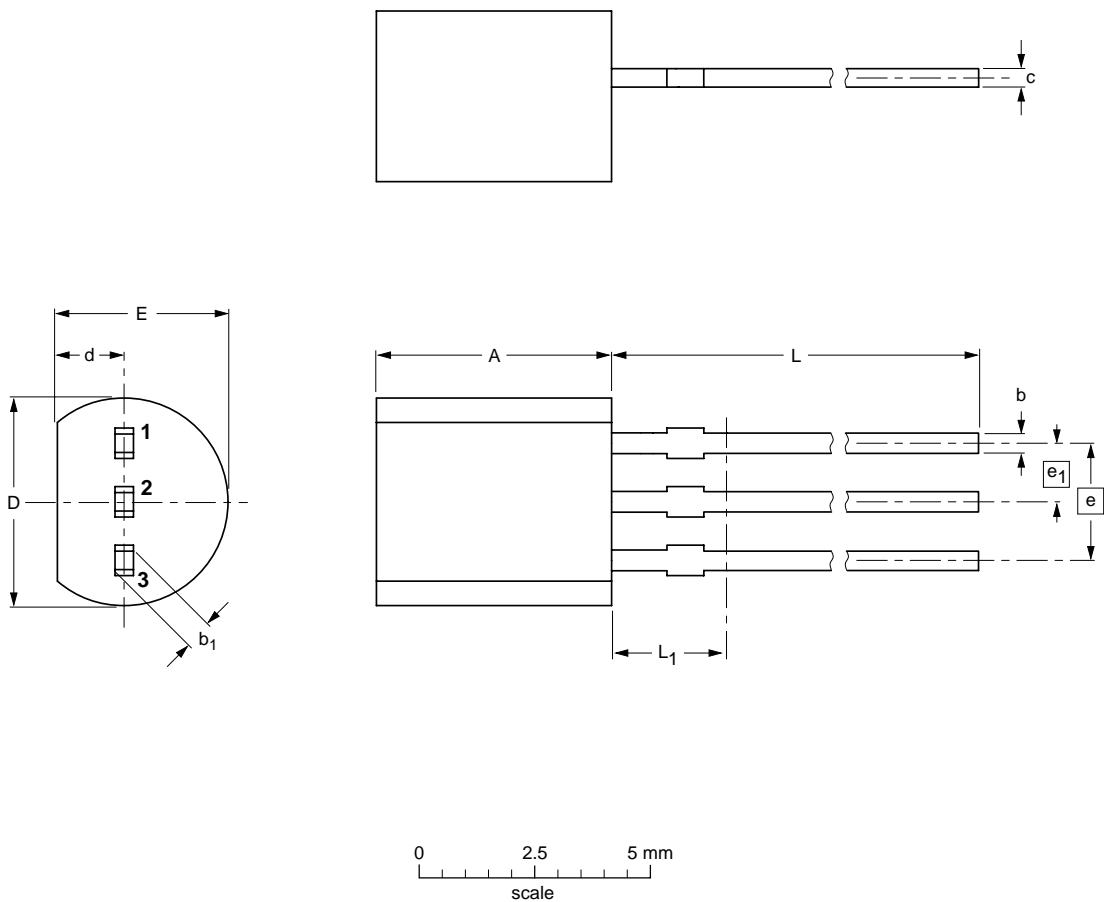
PNP switching transistor

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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

PNP switching transistor

2N3906

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