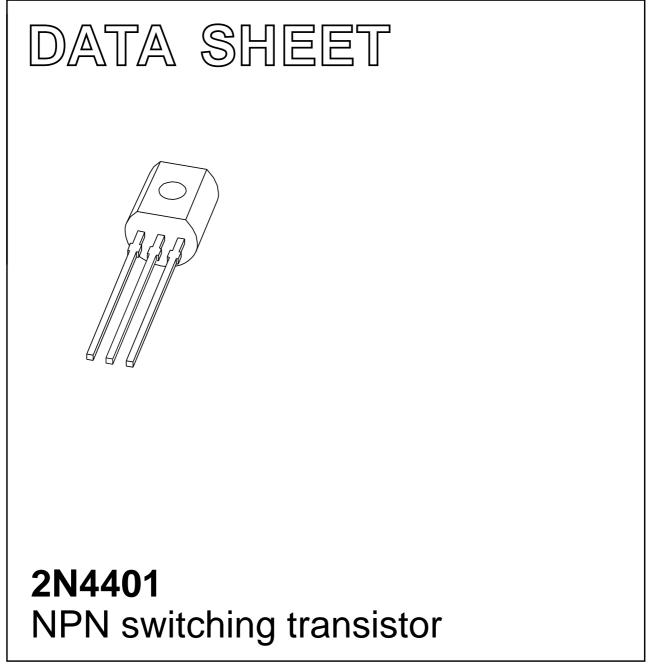
# DISCRETE SEMICONDUCTORS



Product specification Supersedes data of 1999 Apr 23 2004 Oct 28



#### FEATURES

- High current (max. 600 mA)
- Low voltage (max. 40 V).

#### APPLICATIONS

• Industrial and consumer switching applications.

#### DESCRIPTION

NPN switching transistor in a TO-92; SOT54 plastic package. PNP complement: 2N4403.

#### PINNING

PIN	DESCRIPTION	
1	collector	
2	base	
3	emitter	

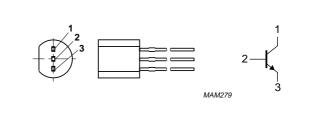


Fig.1 Simplified outline (TO-92; SOT54) and symbol.

#### **ORDERING INFORMATION**

TYPE NUMBER		PACKAGE			
	NAME	DESCRIPTION	VERSION		
2N4401	SC-43A	A plastic single-ended leaded (through hole) package; 3 leads			

#### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	-	60	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	40	V
V <sub>EBO</sub>	emitter-base voltage	open collector	-	6	V
I <sub>C</sub>	collector current (DC)		-	600	mA
I <sub>CM</sub>	peak collector current		-	800	mA
I <sub>BM</sub>	peak base current		-	200	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C; note 1	-	630	mW
T <sub>stg</sub>	storage temperature		-65	+150	°C
Tj	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C

#### Note

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

### 2N4401

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#### THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	note 1	200	K/W

#### Note

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

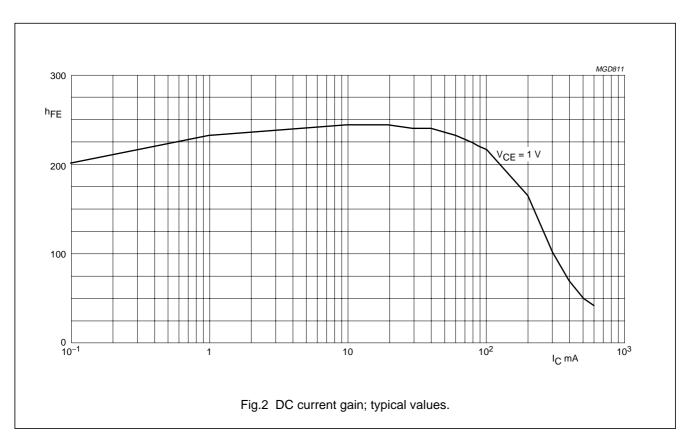
#### CHARACTERISTICS

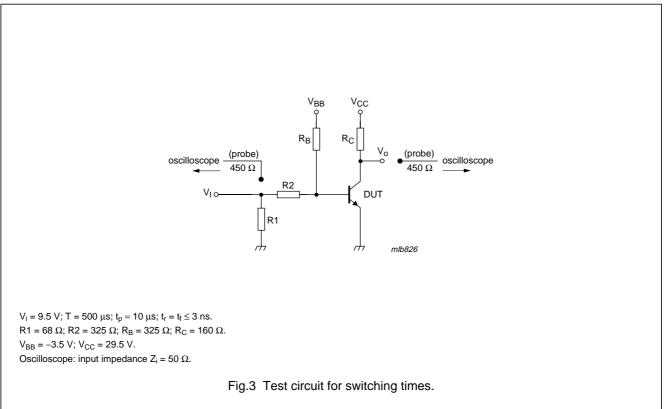
 $T_{amb}$  = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 60 V; I <sub>E</sub> = 0 A	-	50	nA
I <sub>EBO</sub>	emitter-base cut-off current	$V_{EB} = 6 \text{ V}; \text{ I}_{C} = 0 \text{ A}$	-	50	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 1 V; see Fig.2			
		I <sub>C</sub> = 0.1 mA	20	_	
		$I_{\rm C} = 1  \rm{mA}$	40	_	
		I <sub>C</sub> = 10 mA	80	_	
		I <sub>C</sub> = 150 mA; note 1	100	300	
		V <sub>CE</sub> = 2 V; I <sub>C</sub> = 500 mA; note 1	40	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 150 mA; I <sub>B</sub> = 15 mA; note 1	-	400	mV
		I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA; note 1	-	750	mV
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = 150 mA; I <sub>B</sub> = 15 mA; note 1	-	950	mV
		I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA; note 1	-	1.2	V
Cc	collector capacitance	$V_{CB} = 5 \text{ V}; I_E = i_e = 0 \text{ A}; f = 1 \text{ MHz}$	-	6.5	pF
C <sub>e</sub>	emitter capacitance	$V_{EB}$ = 500 mV; I <sub>C</sub> = i <sub>c</sub> = 0 A; f = 1 MHz	-	30	pF
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = 10 V; I <sub>C</sub> = 20 mA; f = 100 MHz	250	-	MHz
Switching	times (between 10 % and 90 % leve	els); see Fig.3			
t <sub>on</sub>	turn-on time	I <sub>Con</sub> = 150 mA; I <sub>Bon</sub> = 15 mA;	_	35	ns
t <sub>d</sub>	delay time	I <sub>Boff</sub> = –15 mA	_	15	ns
t <sub>r</sub>	rise time	1	-	20	ns
t <sub>off</sub>	turn-off time	1	-	250	ns
t <sub>s</sub>	storage time		-	200	ns
t <sub>f</sub>	fall time	1	-	60	ns

#### Note

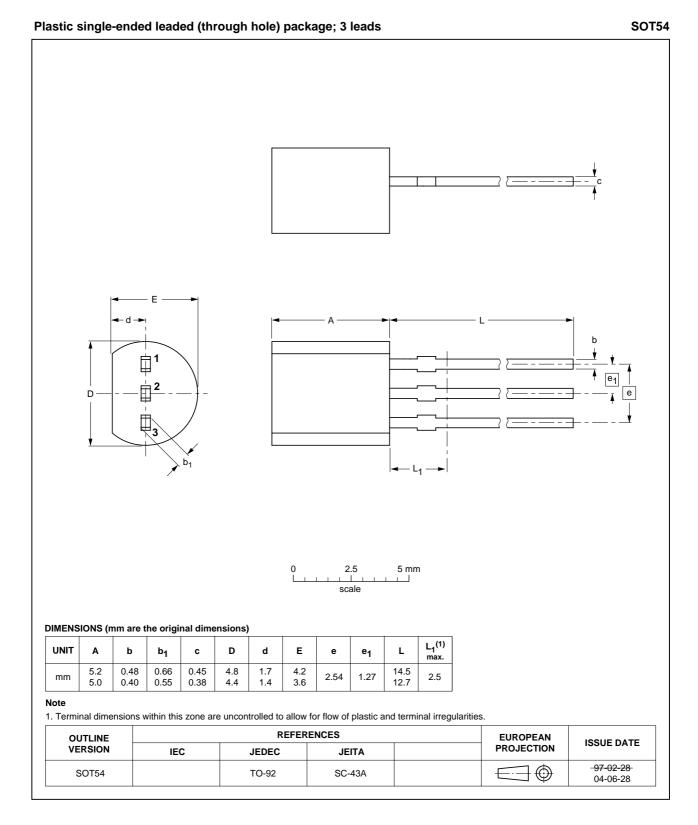
1. Pulse test:  $t_p \leq 300 \ \mu s; \ \delta \leq 0.02.$ 





2N4401

#### PACKAGE OUTLINE



2N4401

2N4401

#### DATA SHEET STATUS

LEVEL	DATA SHEET STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)(3)</sup>	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
11	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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- 3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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