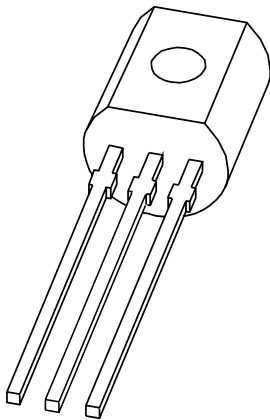


# DATA SHEET



## **PN2222A** NPN switching transistor

Product data sheet  
Supersedes data of 1999 May 21

2004 Oct 11

# NPN switching transistor

# PN2222A

### FEATURES

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

### APPLICATIONS

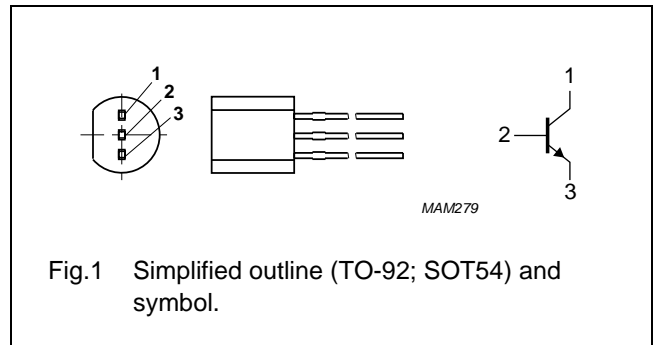
- General purpose switching and linear amplification.

### DESCRIPTION

NPN switching transistor in a TO-92; SOT54 plastic package. PNP complement: PN2907A.

### PINNING

PIN	DESCRIPTION
1	collector
2	base
3	emitter



### ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PN2222A	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	–	75	V
$V_{CEO}$	collector-emitter voltage	open base	–	40	V
$V_{EBO}$	emitter-base voltage	open collector	–	6	V
$I_C$	collector current (DC)		–	600	mA
$I_{CM}$	peak collector current		–	800	mA
$I_{BM}$	peak base current		–	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	–	500	mW
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	junction temperature		–	150	°C
$T_{amb}$	ambient temperature		–65	+150	°C

## NPN switching transistor

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## 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

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

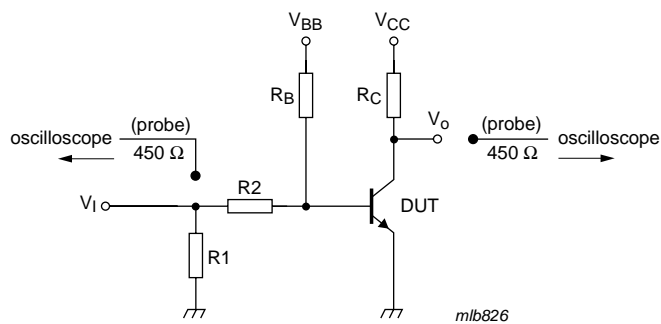
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 60\text{ V}; I_E = 0\text{ A}$	–	10	nA
		$V_{CB} = 60\text{ V}; I_E = 0\text{ A}; T_j = 125\text{ °C}$	–	10	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 3\text{ V}; I_C = 0\text{ A}$	–	10	nA
$h_{FE}$	DC current gain	$V_{CE} = 10\text{ V}; I_C = 0.1\text{ mA}$	35	–	
		$V_{CE} = 10\text{ V}; I_C = 1\text{ mA}$	50	–	
		$V_{CE} = 10\text{ V}; I_C = 10\text{ mA}$	75	–	
		$V_{CE} = 10\text{ V}; I_C = 10\text{ mA}; T_j = -55\text{ °C}$	35	–	
		$V_{CE} = 1\text{ V}; I_C = 150\text{ mA}$	50	–	
		$V_{CE} = 10\text{ V}; I_C = 150\text{ mA}$	100	300	
		$V_{CE} = 10\text{ V}; I_C = 500\text{ mA}$	40	–	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 150\text{ mA}; I_B = 15\text{ mA}$	–	300	mV
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	1	–	V
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 150\text{ mA}; I_B = 15\text{ mA}$	0.6	1.2	V
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	–	2	V
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	–	8	pF
$C_e$	emitter capacitance	$V_{EB} = 500\text{ mV}; I_C = i_c = 0\text{ A}; f = 1\text{ MHz}$	–	25	pF
$f_T$	transition frequency	$V_{CE} = 20\text{ V}; I_C = 20\text{ mA}; f = 100\text{ MHz}$	300	–	MHz
F	noise figure	$V_{CE} = 5\text{ V}; I_C = 100\text{ }\mu\text{A}; R_S = 1\text{ k}\Omega;$ $f = 1\text{ kHz}$	–	4	dB

## Switching times (between 10 % and 90 % levels); see Fig.2

$t_{on}$	turn-on time	$I_{Con} = 150\text{ mA}; I_{Bon} = 15\text{ mA};$ $I_{Boff} = -15\text{ mA}; T_{amb} = 25\text{ °C}$	–	35	ns
$t_d$	delay time		–	15	ns
$t_r$	rise time		–	20	ns
$t_{off}$	turn-off time		–	250	ns
$t_s$	storage time		–	200	ns
$t_f$	fall time		–	60	ns

NPN switching transistor

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$V_i = 9.5 \text{ V}$ ;  $T = 500 \text{ } \mu\text{s}$ ;  $t_p = 10 \text{ } \mu\text{s}$ ;  $t_r = t_f \leq 3 \text{ ns}$ .  
 $R_1 = 68 \text{ } \Omega$ ;  $R_2 = 325 \text{ } \Omega$ ;  $R_B = 325 \text{ } \Omega$ ;  $R_C = 160 \text{ } \Omega$ .  
 $V_{BB} = -3.5 \text{ V}$ ;  $V_{CC} = 29.5 \text{ V}$ .  
 Oscilloscope: input impedance  $Z_i = 50 \text{ } \Omega$ .

Fig.2 Test circuit for switching times.

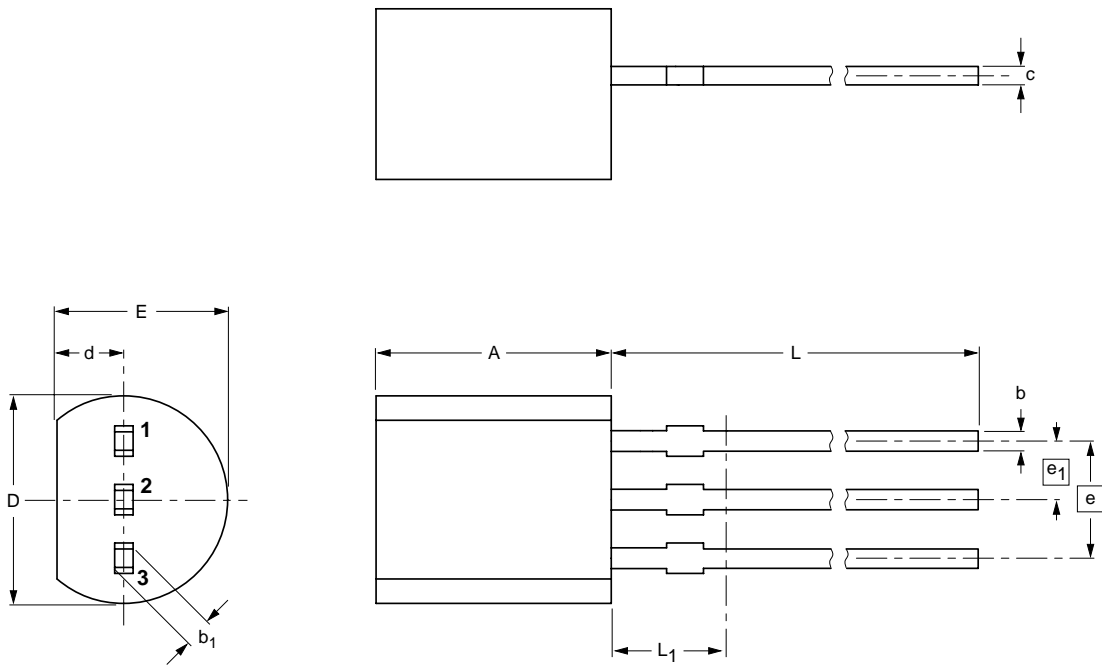
NPN switching transistor

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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 <sub>1</sub>	c	D	d	E	e	e <sub>1</sub>	L	L <sub>1</sub> <sup>(1)</sup> 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		04-06-28 04-11-16

## NPN switching transistor

PN2222A

## DATA SHEET STATUS

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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## **Contact information**

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