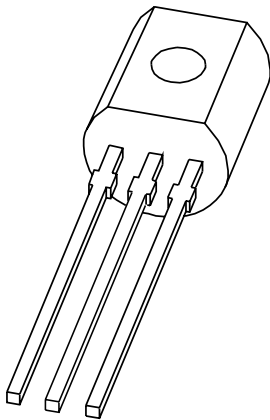


DATA SHEET



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

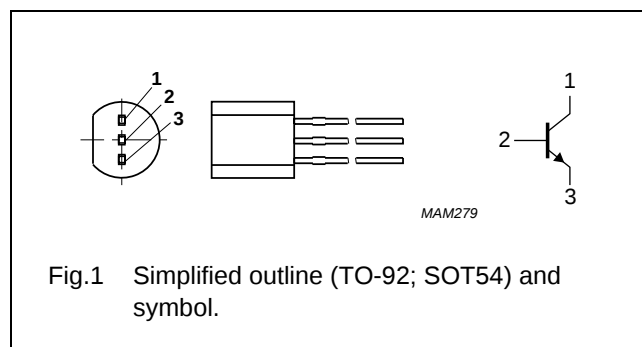
- General purpose switching and linear amplification.

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.

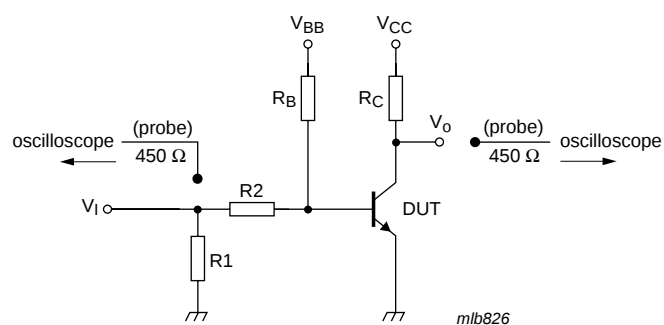
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector-base cut-off current	$V_{CB} = 60\text{ V}; I_E = 0\text{ A}$	–	10	nA
		$V_{CB} = 60\text{ V}; I_E = 0\text{ A}; T_j = 125\text{ °C}$	–	10	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 3\text{ V}; I_C = 0\text{ A}$	–	10	nA
h_{FE}	DC current 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	$V_{CE} = 5\text{ V}; I_C = 100\text{ μA}; R_S = 1\text{ k}\Omega; f = 1\text{ kHz}$	–	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

PN2222A



$V_I = 9.5\text{ V}$; $T = 500\text{ }\mu\text{s}$; $t_p = 10\text{ }\mu\text{s}$; $t_r = t_f \leq 3\text{ ns}$.

$R1 = 68\text{ }\Omega$; $R2 = 325\text{ }\Omega$; $R_B = 325\text{ }\Omega$; $R_C = 160\text{ }\Omega$.

$V_{BB} = -3.5\text{ V}$; $V_{CC} = 29.5\text{ V}$.

Oscilloscope: input impedance $Z_i = 50\text{ }\Omega$.

Fig.2 Test circuit for switching times.

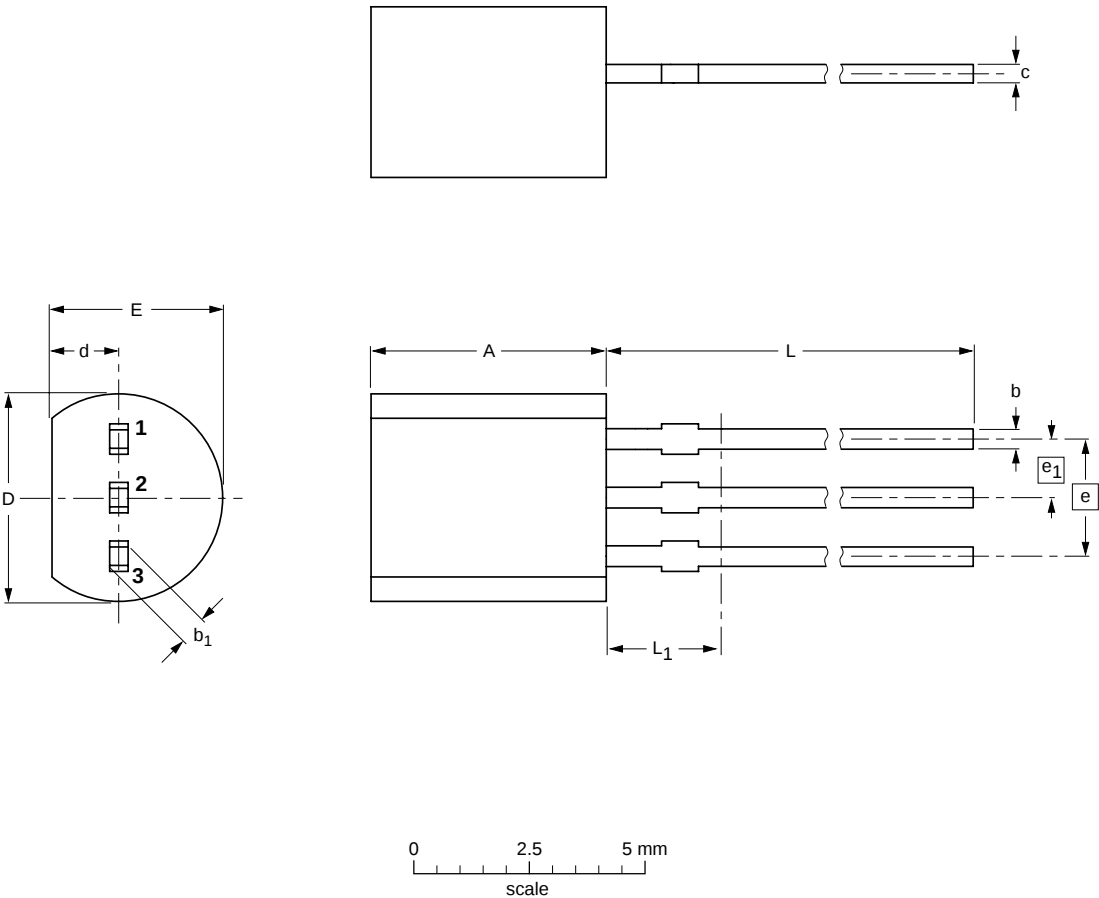
NPN switching transistor

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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 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			04-06-28 04-11-16

NPN switching transistor

PN2222A

DATA SHEET STATUS

DOCUMENT STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	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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Customer notification

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

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