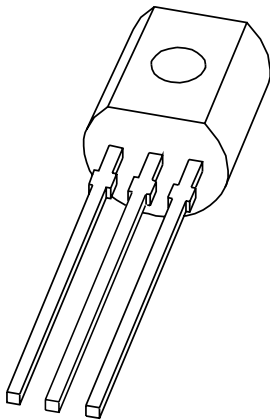


# DATA SHEET



## **PH2369** NPN switching transistor

Product data sheet  
Supersedes data of 1999 Apr 27

2004 Oct 11

# NPN switching transistor

# PH2369

### FEATURES

- Low current (max. 200 mA)
- Low voltage (max. 15 V).

### APPLICATIONS

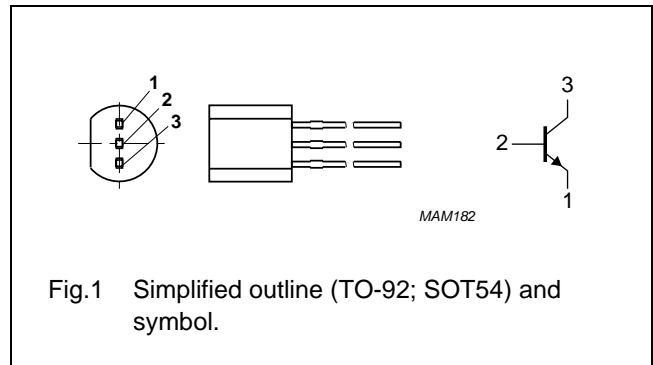
- High-speed switching.

### DESCRIPTION

NPN switching transistor in a TO-92; SOT54 plastic package.

### PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector



### ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PH2369	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
$V_{CB0}$	collector-base voltage	open emitter	-	40	V
$V_{CEO}$	collector-emitter voltage	open base	-	15	V
$V_{EBO}$	emitter-base voltage	open collector	-	4.5	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	$^\circ\text{C}$

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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.

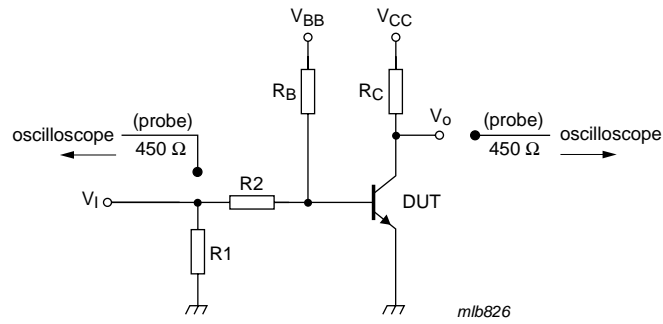
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 20\text{ V}; I_E = 0\text{ A}$	–	400	nA
		$V_{CB} = 20\text{ V}; I_E = 0\text{ A}; T_j = 125\text{ °C}$	–	30	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 4\text{ V}; I_C = 0\text{ A}$	–	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 1\text{ V}; I_C = 10\text{ mA}$	40	120	
		$V_{CE} = 1\text{ V}; I_C = 10\text{ mA}; T_{amb} = -55\text{ °C}$	20	–	
		$V_{CE} = 2\text{ V}; I_C = 100\text{ mA}$	20	–	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	–	250	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	700	850	mV
$C_c$	collector capacitance	$V_{CB} = 5\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	–	4	pF
$C_e$	emitter capacitance	$V_{EB} = 1\text{ V}; I_C = i_c = 0\text{ A}; f = 1\text{ MHz}$	–	4.5	pF
$f_T$	transition frequency	$V_{CE} = 10\text{ V}; I_C = 10\text{ mA}; f = 100\text{ MHz}$	500	–	MHz

## Switching times (between 10 % and 90 % levels)

$t_{on}$	turn-on time	$I_{Con} = 10\text{ mA}; I_{Bon} = 3\text{ mA}; I_{Boff} = -1.5\text{ mA};$ see Fig.2 test conditions A	–	10	ns
$t_d$	delay time		–	4	ns
$t_r$	rise time		–	6	ns
$t_{off}$	turn-off time		–	20	ns
$t_s$	storage time		–	10	ns
$t_f$	fall time		–	10	ns
$t_{on}$	turn-on time	$I_{Con} = 100\text{ mA}; I_{Bon} = 40\text{ mA}; I_{Boff} = -20\text{ mA};$ see Fig.2 test conditions B	–	13	ns
$t_{off}$	turn-off time		–	35	ns

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**Test conditions A.**

$V_i = 0.5$  to  $4.2$  V;  $T = 500$   $\mu$ s;  $t_p = 10$   $\mu$ s;  $t_r = t_f \leq 3$  ns.  
 $R_1 = 56$   $\Omega$ ;  $R_2 = 1$  k $\Omega$ ;  $R_B = 1$  k $\Omega$ ;  $R_C = 270$   $\Omega$ .  
 $V_{BB} = 0.2$  V;  $V_{CC} = 2.7$  V.  
 Oscilloscope: input impedance  $Z_i = 50$   $\Omega$ .

**Test conditions B.**

$V_i = 0.5$  to  $4.52$  V;  $T = 200$   $\mu$ s;  $t_p = 10$   $\mu$ s;  $t_r = t_f \leq 3$  ns.  
 $R_1 = 100$   $\Omega$ ;  $R_2 = 68$   $\Omega$ ;  $R_B = 390$   $\Omega$ ;  $R_C = 47$   $\Omega$ .  
 $V_{BB} = -3$  V;  $V_{CC} = 4.6$  V.  
 Oscilloscope: input impedance  $Z_i = 50$   $\Omega$ .

Fig.2 Test circuit for switching times.

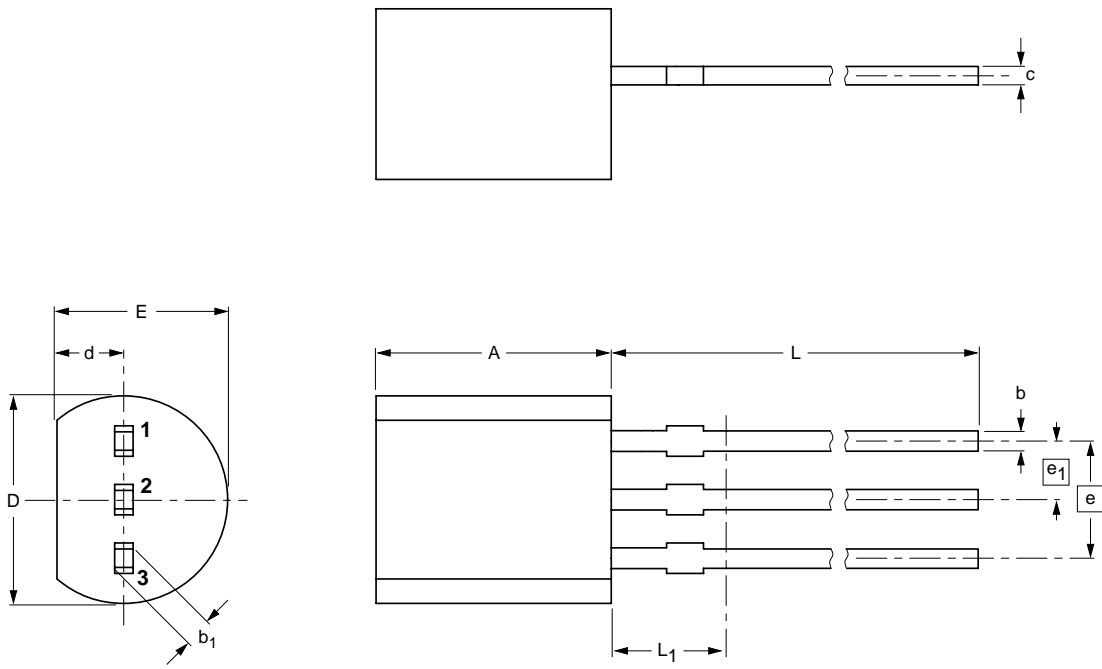
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PACKAGE OUTLINE

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

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## 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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## **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.

## **Contact information**

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