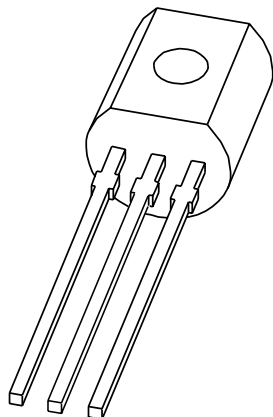


DATA SHEET



PN2369; PN2369A NPN switching transistors

Product specification
Supersedes data of September 1994
File under Discrete Semiconductors, SC04

1997 May 07

NPN switching transistors

PN2369; PN2369A

FEATURES

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

APPLICATIONS

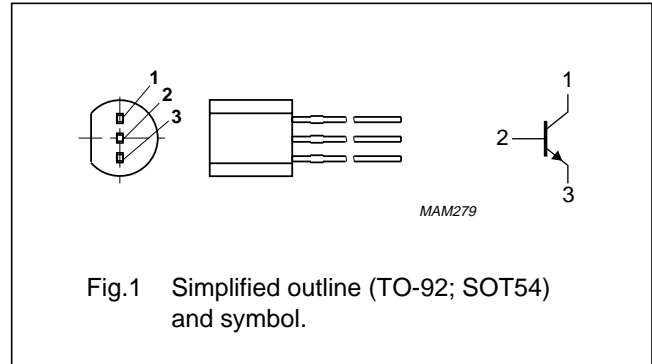
- High-speed switching applications.

DESCRIPTION

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

PINNING

PIN	DESCRIPTION
1	collector
2	base
3	emitter



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	–	15	V
I_C	collector current (DC)		–	–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	–	–	500	mW
h_{FE}	DC current gain	$I_C = 10\text{ mA}; V_{CE} = 1\text{ V}$	40	–	120	
		$I_C = 10\text{ mA}; V_{CE} = 350\text{ mV}$	40	–	120	
f_T	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	500	–	–	MHz
t_{off}	turn-off time	$I_{Con} = 10\text{ mA}; I_{Bon} = 3\text{ mA}; I_{Boff} = -1.5\text{ mA}$	–	–	30	ns

NPN switching transistors

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LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
V_{EBO}	emitter-base voltage	open collector	–	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	$T_{amb} \leq 25\text{ °C}$	–	500	mW
T_{stg}	storage temperature		–55	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–55	+150	°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.

CHARACTERISTICS

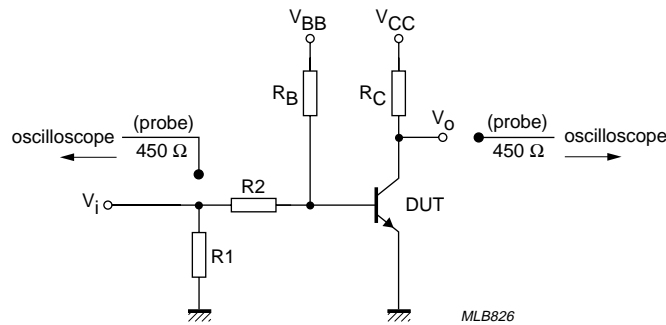
$T_j = 25\text{ °C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = 20\text{ V}$	–	–	400	nA
		$I_E = 0; V_{CB} = 20\text{ V}; T_{amb} = 125\text{ °C}$	–	–	30	μA
I_{EBO}	emitter cut-off current	$I_C = 0; V_{EB} = 4\text{ V}$	–	–	100	nA
h_{FE}	DC current gain PN2369	$I_C = 10\text{ mA}; V_{CE} = 1\text{ V}$	40	–	120	
		$I_C = 10\text{ mA}; V_{CE} = 1\text{ V}; T_{amb} = -55\text{ °C}$	20	–	–	
		$I_C = 100\text{ mA}; V_{CE} = 2\text{ V}$	20	–	–	
h_{FE}	DC current gain PN2369A	$I_C = 10\text{ mA}; V_{CE} = 350\text{ mV}$	40	–	120	
		$I_C = 10\text{ mA}; V_{CE} = 350\text{ mV}; T_{amb} = -55\text{ °C}$	20	–	–	
		$I_C = 30\text{ mA}; V_{CE} = 400\text{ mV}$	30	–	–	
		$I_C = 100\text{ mA}; V_{CE} = 1\text{ V}$	20	–	–	
V_{CEsat}	collector-emitter saturation voltage PN2369	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	–	–	250	mV

NPN switching transistors

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SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CEsat}	collector-emitter saturation voltage PN2369A	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	–	–	200	mV
		$I_C = 10\text{ mA}; I_B = 10\text{ mA}$	–	–	300	mV
		$I_C = 30\text{ mA}; I_B = 3\text{ mA}$	–	–	250	mV
		$I_C = 100\text{ mA}; I_B = 10\text{ mA}$	–	–	500	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	700	–	850	mV
C_c	collector capacitance	$I_E = I_e = 0; V_{CB} = 5\text{ V}; f = 1\text{ MHz}$	–	–	4	pF
f_T	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	500	–	–	MHz
Switching times (between 10% and 90% levels); see Fig.2						
t_{on}	turn-on time	$I_{Con} = 10\text{ mA}; I_{Bon} = 3\text{ mA};$ $I_{Boff} = -1.5\text{ mA}$	–	8	10	ns
t_d	delay time		–	–	4	ns
t_r	rise time		–	–	6	ns
t_{off}	turn-off time		–	10	30	ns
t_s	storage time		–	–	15	ns
t_f	fall time		–	–	15	ns



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

Fig.2 Test circuit for switching times.

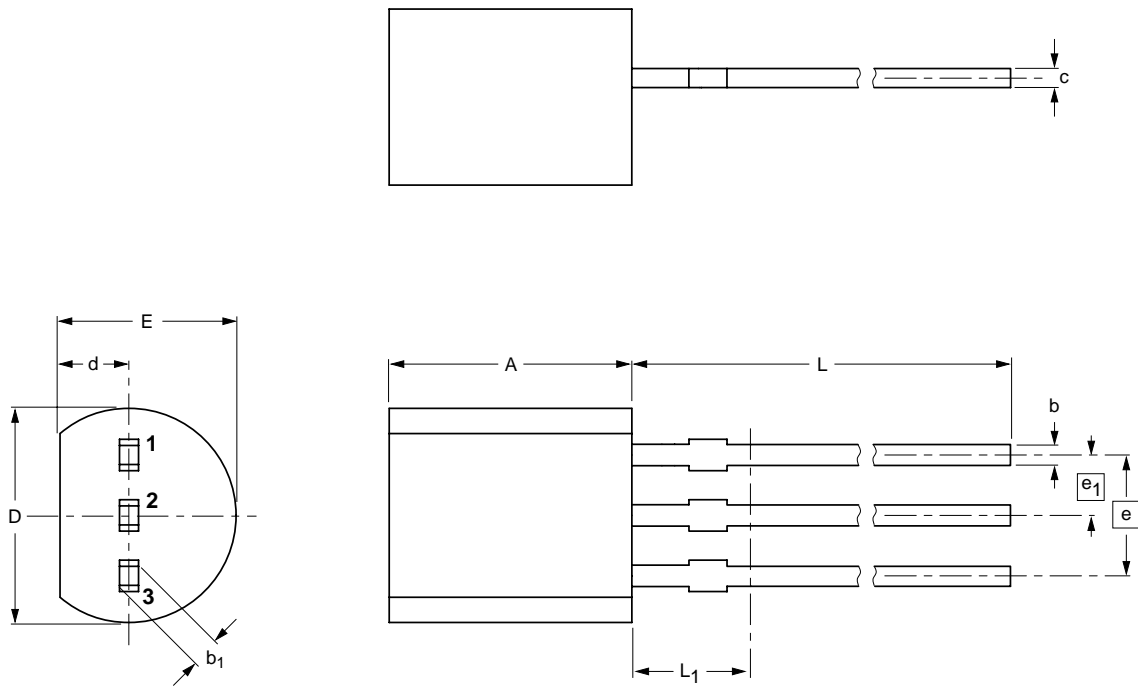
NPN switching transistors

PN2369; PN2369A

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⁾
mm	5.2	0.48	0.66	0.45	4.8	1.7	4.2	2.54	1.27	14.5	2.5
	5.0	0.40	0.56	0.40	4.4	1.4	3.6				

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	EIAJ			
SOT54		TO-92	SC-43			97-02-28

NPN switching transistors

PN2369; PN2369A

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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NPN switching transistors

PN2369; PN2369A

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