

# DATA SHEET



## **PN2369A** NPN switching transistor

Product specification  
Supersedes data of 1999 Apr 14

2004 Dec 08

# NPN switching transistor

# 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     |

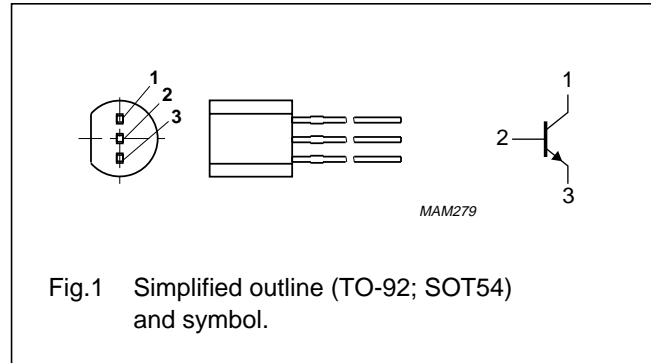


Fig.1 Simplified outline (TO-92; SOT54) and symbol.

### ORDERING INFORMATION

| TYPE NUMBER | PACKAGE |   |         |
|-------------|---------|---|---------|
|             | NAME    | DESCRIPTION   | VERSION |
| PN2369A     | 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                            | –    | 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   | $T_{amb} \leq 25\text{ }^\circ\text{C}$ | –    | 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 | $^\circ\text{C}$ |

### 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.

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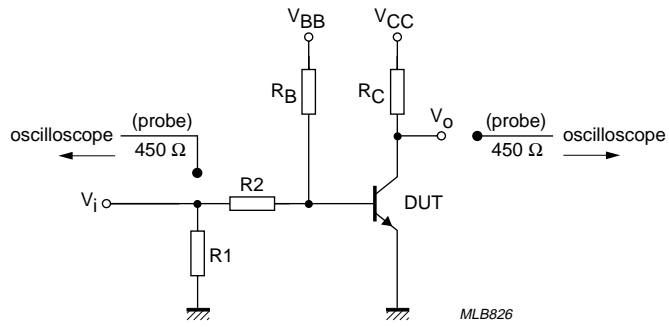
## CHARACTERISTICS

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

| SYMBOL   | PARAMETER                            | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|--|--------------------------------------|--|------|------|------|---------------|
| $I_{CBO}$  | collector-base cut-off current       | $V_{CB} = 20\text{ V}; I_E = 0\text{ A}$                                   | –    | –    | 400  | nA            |
|  |                                      | $V_{CB} = 20\text{ V}; I_E = 0\text{ A}; T_{amb} = 125\text{ °C}$          | –    | –    | 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                      | $V_{CE} = 350\text{ mV}; I_C = 10\text{ mA}$                               | 40   | –    | 120  |               |
|  |                                      | $V_{CE} = 350\text{ mV}; I_C = 10\text{ mA}; T_{amb} = -55\text{ °C}$      | 20   | –    | –    |               |
|  |                                      | $V_{CE} = 400\text{ mV}; I_C = 30\text{ mA}$                               | 30   | –    | –    |               |
|  |                                      | $V_{CE} = 1\text{ V}; I_C = 100\text{ mA}$                                 | 20   | –    | –    |               |
| $V_{CEsat}$  | collector-emitter saturation voltage | $I_C = 10\text{ mA}; I_B = 1\text{ mA}$                                    | –    | –    | 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                | $V_{CB} = 5\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$            | –    | –    | 4    | pF            |
| $f_T$  | transition frequency                 | $V_{CE} = 10\text{ V}; I_C = 10\text{ mA}; f = 100\text{ MHz}$             | 500  | –    | –    | MHz           |
| <b>Switching times (between 10% and 90% levels); see Fig.2</b> |                                      |  |      |      |      |               |
| $t_{on}$   | 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   | 20   | ns            |
| $t_s$  | storage time                         |  | –    | –    | 10   | ns            |
| $t_f$  | fall time                            |  | –    | –    | 10   | ns            |

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

Fig.2 Test circuit for switching times.

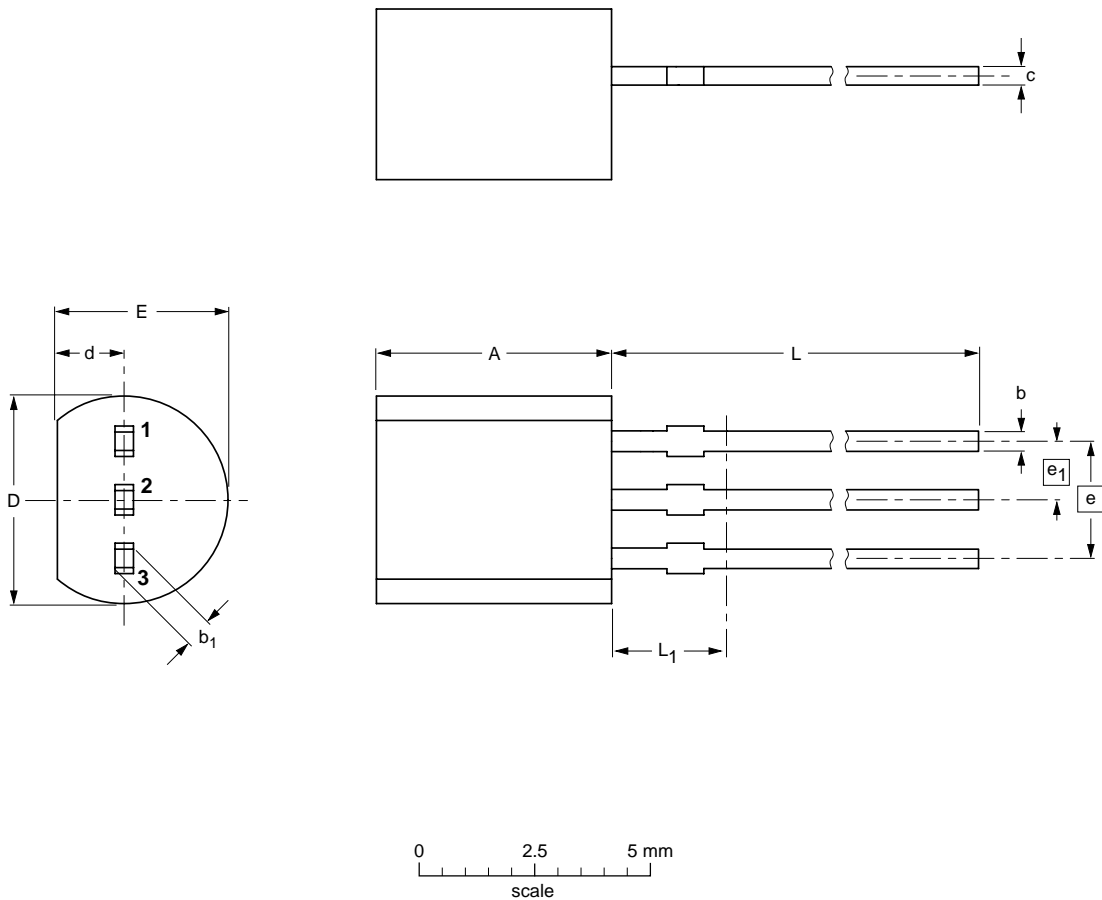
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PACKAGE OUTLINE

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><br>max. |
|------|------------|--------------|----------------|--------------|------------|------------|------------|------|----------------|--------------|---------------------------------------|
| mm   | 5.2<br>5.0 | 0.48<br>0.40 | 0.66<br>0.55   | 0.45<br>0.38 | 4.8<br>4.4 | 1.7<br>1.4 | 4.2<br>3.6 | 2.54 | 1.27           | 14.5<br>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 |                     | <del>04-06-28</del><br>04-11-16 |

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## DATA SHEET STATUS

| LEVEL | DATA SHEET STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)(3)</sup> | DEFINITION   |
|-------|----------------------------------|----------------------------------|--|
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