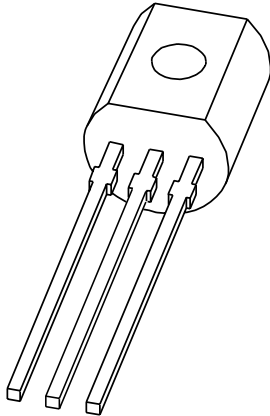


# DATA SHEET



## **MPSH10**

**NPN 1 GHz general purpose  
switching transistor**

Product specification  
Supersedes data of September 1995  
File under Discrete Semiconductors, SC14

1998 Aug 27

## NPN 1 GHz general purpose switching transistor

## MPSH10

## FEATURES

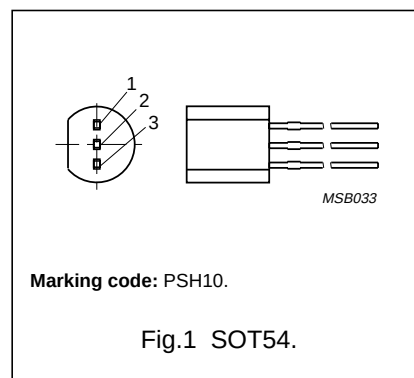
- Low cost
- High power gain.

## DESCRIPTION

Silicon NPN general purpose transistor in a SOT54 (TO-92) package. PNP complement is the MPSH81.

## PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | collector   |
| 2   | emitter     |
| 3   | base        |



## QUICK REFERENCE DATA

| SYMBOL    | PARAMETER                              | CONDITIONS                                                                                     | MIN. | MAX. | UNIT |
|-----------|----------------------------------------|------------------------------------------------------------------------------------------------|------|------|------|
| $V_{CBO}$ | collector-base voltage                 | open emitter                                                                                   | —    | 30   | V    |
| $V_{CEO}$ | collector-emitter voltage              | open base                                                                                      | —    | 25   | V    |
| $V_{EBO}$ | emitter-base voltage                   | open collector                                                                                 | —    | 3    | V    |
| $P_{tot}$ | total power dissipation                | $T_s = 25\text{ °C}$ ; note 1                                                                  | —    | 1    | W    |
| $T_j$     | junction temperature                   |                                                                                                | —    | 150  | °C   |
| $h_{FE}$  | DC current gain                        | $V_{CE} = 10\text{ V}$ ; $I_C = 4\text{ mA}$                                                   | 60   | —    |      |
| $C_{re}$  | collector-emitter feedback capacitance | $V_{CB} = 10\text{ V}$ ; $I_E = 0$ ; $f = 1\text{ MHz}$                                        | —    | 0.7  | pF   |
| $C_{rb}$  | collector-base feedback capacitance    | $V_{CB} = 10\text{ V}$ ; $I_E = 0$ ; $f = 1\text{ MHz}$                                        | 0.35 | 0.65 | pF   |
| $f_T$     | transition frequency                   | $V_{CE} = 10\text{ V}$ ; $I_C = 4\text{ mA}$ ; $f = 100\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$ | 650  | —    | MHz  |
| $r_b C_c$ | collector-base time constant           | $V_{CE} = 10\text{ V}$ ; $I_C = 4\text{ mA}$ ; $f = 100\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$ | —    | 9    | ps   |

## Note

1.  $T_s$  is the temperature at the soldering point of the collector lead, 4 mm from the body.

## 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                  | —    | 30   | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                     | —    | 25   | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector                | —    | 3    | V    |
| $I_C$     | collector current (DC)    |                               | —    | 40   | mA   |
| $P_{tot}$ | total power dissipation   | $T_s = 25\text{ °C}$ ; note 1 | —    | 1    | W    |
| $T_{stg}$ | storage temperature       |                               | −65  | +150 | °C   |
| $T_j$     | junction temperature      |                               | —    | 150  | °C   |

## Note

1.  $T_s$  is the temperature at the soldering point of the collector lead, 4 mm from the body.

## NPN 1 GHz general purpose switching transistor

## MPSH10

## THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                           | CONDITIONS | VALUE | UNIT |
|---------------|-----------------------------------------------------|------------|-------|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | note 1     | 125   | K/W  |
| $R_{th\ j-a}$ | thermal resistance from junction to ambient         |            | 250   | K/W  |

## Note

1.  $T_s$  is the temperature at the soldering point of the collector lead, 4 mm from the body.

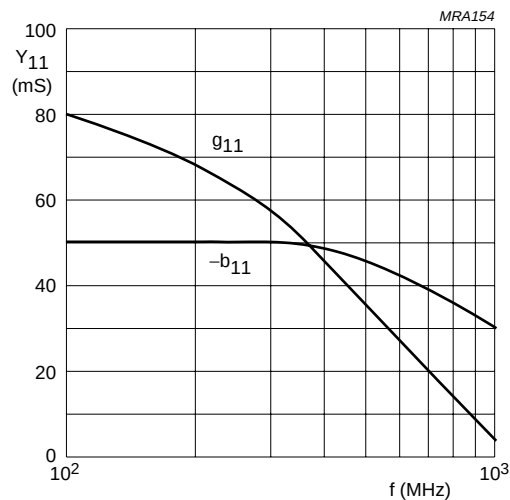
## CHARACTERISTICS

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

| SYMBOL        | PARAMETER                              | CONDITIONS                                                                                        | MIN. | MAX. | UNIT |
|---------------|----------------------------------------|---------------------------------------------------------------------------------------------------|------|------|------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage       | open emitter; $I_C = 100\text{ }\mu\text{A}$ ; $I_E = 0$                                          | 30   | –    | V    |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage    | open base; $I_C = 1\text{ mA}$ ; $I_B = 0$                                                        | 25   | –    | V    |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage         | open collector; $I_E = 10\text{ }\mu\text{A}$ ; $I_C = 0$                                         | 3    | –    | V    |
| $V_{CEsat}$   | collector-emitter saturation voltage   | $I_C = 4\text{ mA}$ ; $I_B = 0.4\text{ mA}$                                                       | –    | 0.5  | V    |
| $V_{BEon}$    | base-emitter ON voltage                | $V_{CE} = 10\text{ V}$ ; $I_C = 4\text{ mA}$                                                      | –    | 0.95 | V    |
| $I_{CBO}$     | collector-base cut-off current         | $V_{CB} = 25\text{ V}$ ; $I_E = 0$                                                                | –    | 100  | nA   |
| $I_{EBO}$     | emitter-base cut-off current           | $V_{CB} = 25\text{ V}$ ; $I_C = 0$                                                                | –    | 100  | nA   |
| $h_{FE}$      | DC current gain                        | $V_{CE} = 10\text{ V}$ ; $I_C = 4\text{ mA}$                                                      | 60   | –    |      |
| $C_{re}$      | collector-emitter feedback capacitance | $V_{CB} = 10\text{ V}$ ; $I_E = I_E = 0$ ; $f = 1\text{ MHz}$                                     | –    | 0.7  | pF   |
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| $r_b C_c$     | collector-base time constant           | $V_{CB} = 10\text{ V}$ ; $I_C = 4\text{ mA}$ ;<br>$f = 100\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$ | –    | 9    | ps   |

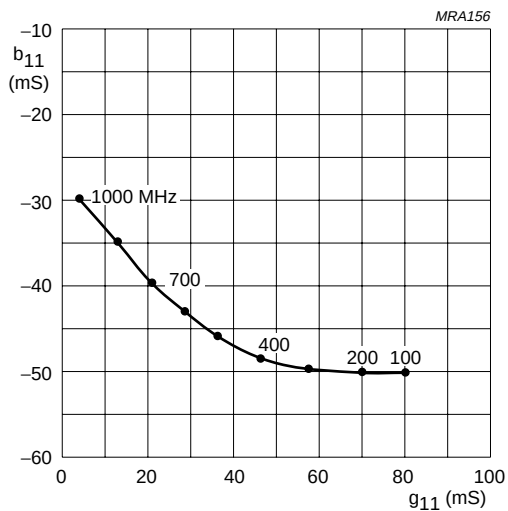
NPN 1 GHz general purpose switching transistor

MPSH10



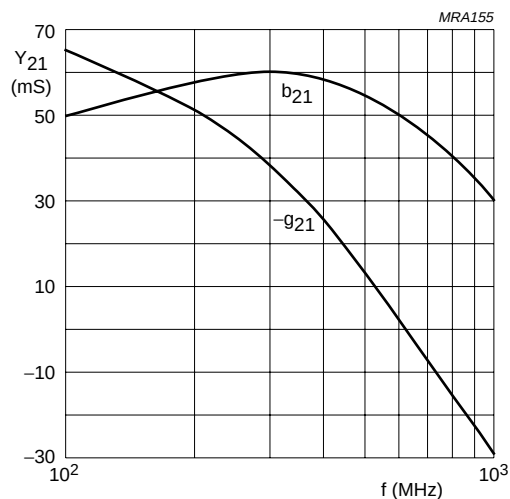
$V_{CB} = 10\text{ V}; I_C = 4\text{ mA}$ .

Fig.2 Common base input admittance ( $Y_{11}$ ) as a function of frequency.



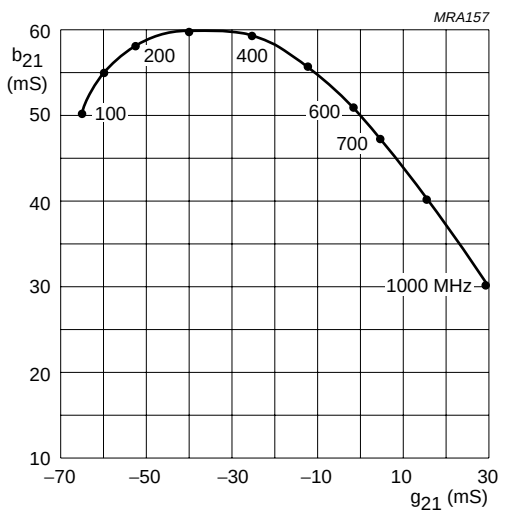
$V_{CB} = 10\text{ V}; I_C = 4\text{ mA}$ .

Fig.3 Common base input admittance ( $Y_{11}$ ).



$V_{CB} = 10\text{ V}; I_C = 4\text{ mA}$ .

Fig.4 Common base forward transfer admittance ( $Y_{21}$ ) as a function of frequency.

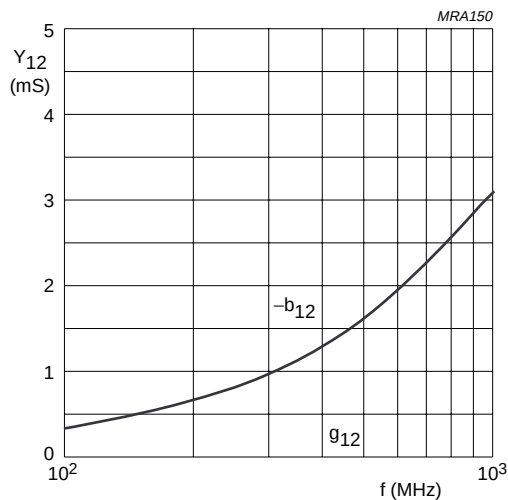


$V_{CB} = 10\text{ V}; I_C = 4\text{ mA}$ .

Fig.5 Common base forward transfer admittance ( $Y_{21}$ ).

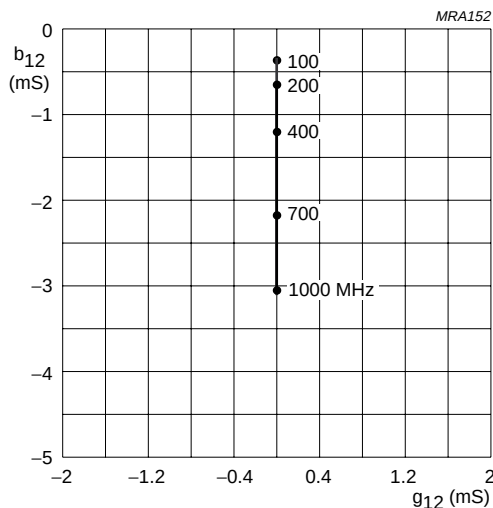
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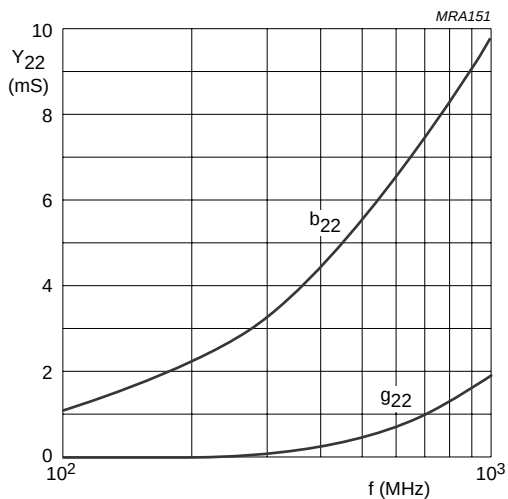
$V_{CB} = 10\text{ V}$ ;  $I_C = 4\text{ mA}$ .

Fig.6 Common base reverse transfer admittance ( $Y_{12}$ ) as a function of frequency.



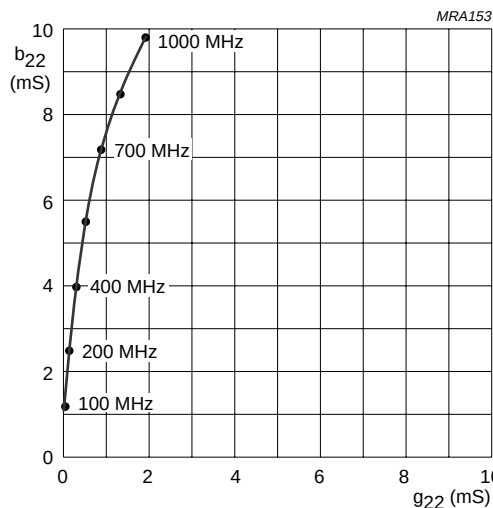
$V_{CB} = 10\text{ V}$ ;  $I_C = 4\text{ mA}$ .

Fig.7 Common base reverse transfer admittance ( $Y_{12}$ ).



$V_{CB} = 10\text{ V}$ ;  $I_C = 4\text{ mA}$ .

Fig.8 Common base reverse admittance ( $Y_{22}$ ) as a function of frequency.



$V_{CB} = 10\text{ V}$ ;  $I_C = 4\text{ mA}$ .

Fig.9 Common base reverse admittance ( $Y_{22}$ ).

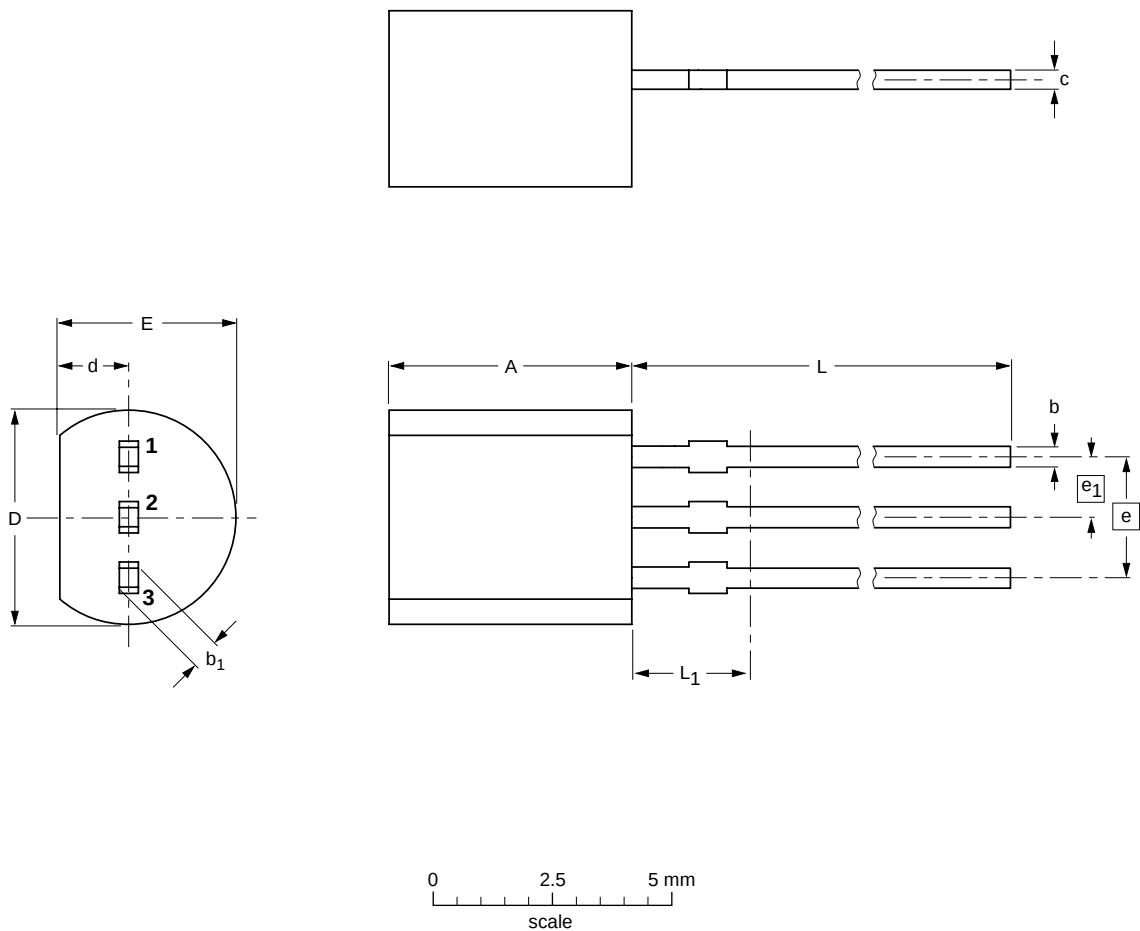
NPN 1 GHz general purpose switching transistor

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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> |
|------|------------|--------------|----------------|--------------|------------|------------|------------|------|----------------|--------------|-------------------------------|
| mm   | 5.2<br>5.0 | 0.48<br>0.40 | 0.66<br>0.56   | 0.45<br>0.40 | 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<br>VERSION | REFERENCES |       |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE |
|--------------------|------------|-------|-------|--|---------------------------------------------------------------------------------------|------------|
|                    | IEC        | JEDEC | EIAJ  |  |                                                                                       |            |
| SOT54              |            | TO-92 | SC-43 |  |  | 97-02-28   |

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**NPN 1 GHz general purpose switching transistor****MPSH10**

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**DEFINITIONS**

| <b>Data Sheet Status</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 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.                                |
| <b>Limiting values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                       |
| 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. |                                                                                       |
| <b>Application information</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                       |                                                                                       |

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