

# BFPQ540

NPN wideband transistor

Rev. 04 — 25 September 2007

Product data sheet

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NXP Semiconductors

# NPN wideband transistor

# BFQ540

### FEATURES

- High gain
- High output voltage
- Low noise
- Gold metallization ensures excellent reliability
- Low thermal resistance.

### APPLICATIONS

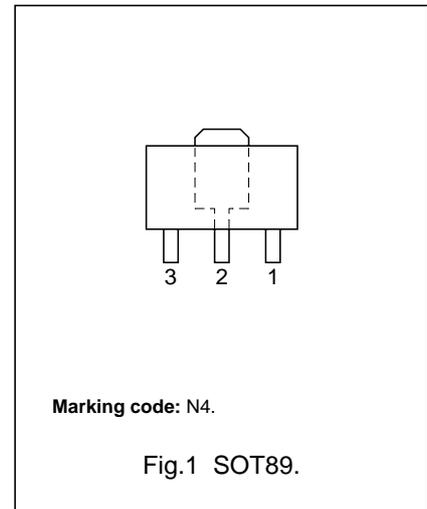
- VHF, UHF and CATV amplifiers.

### DESCRIPTION

NPN wideband transistor in a SOT89 plastic package.

### PINNING

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



### QUICK REFERENCE DATA

| SYMBOL       | PARAMETER                 | CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
|--------------|---------------------------|---|------|------|------|------|
| $V_{CBO}$    | collector-base voltage    | open emitter  | –    | –    | 20   | V    |
| $V_{CES}$    | collector-emitter voltage | $R_{BE} = 0$  | –    | –    | 15   | V    |
| $V_{EBO}$    | collector-base voltage    | open collector  | –    | –    | 2    | V    |
| $I_C$        | collector current (DC)    |   | –    | –    | 120  | mA   |
| $P_{tot}$    | total power dissipation   | $T_s \leq 60\text{ °C}$ ; note 1  | –    | –    | 1.2  | W    |
| $h_{FE}$     | DC current gain           | $I_C = 40\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $T_j = 25\text{ °C}$                             | 100  | 120  | 250  |      |
| $f_T$        | transition frequency      | $I_C = 40\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $f = 1\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$    | –    | 9    | –    | GHz  |
| $ S_{21} ^2$ | insertion power gain      | $I_C = 40\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$  | 12   | 13   | –    | dB   |
| F            | noise figure              | $I_C = 40\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $f = 900\text{ MHz}$ ; $\Gamma_S = \Gamma_{opt}$ | –    | 1.9  | 2.4  | dB   |

### Note

1.  $T_s$  is the temperature at the soldering point of the collector pin.

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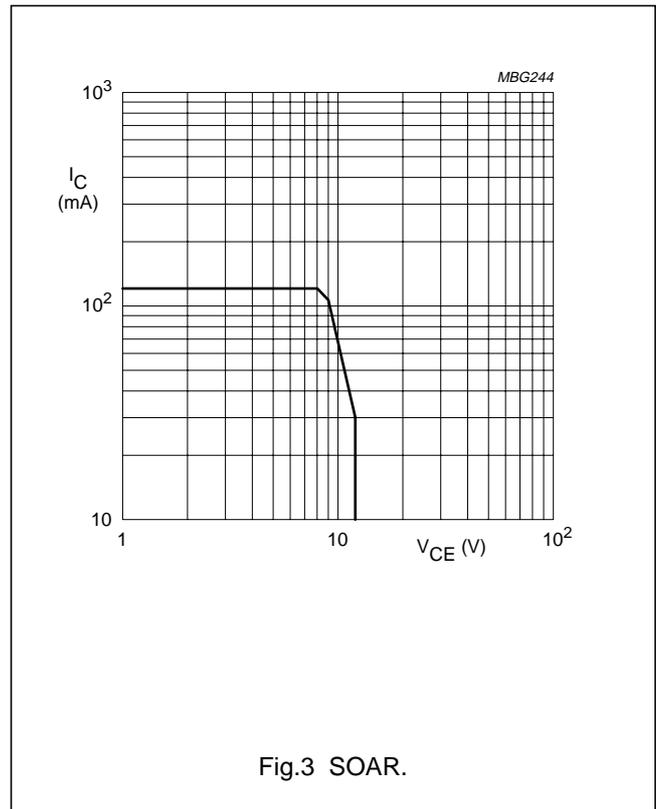
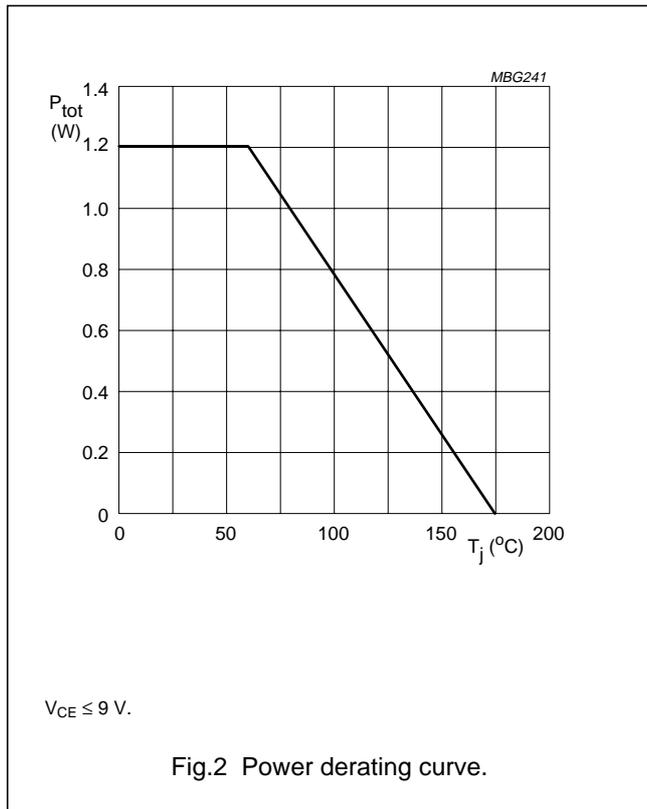
**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| SYMBOL    | PARAMETER                      | CONDITIONS                          | MIN. | MAX. | UNIT             |
|-----------|--------------------------------|-------------------------------------|------|------|------------------|
| $V_{CBO}$ | collector-base voltage         | open emitter                        | –    | 20   | V                |
| $V_{CES}$ | collector-emitter voltage      | $R_{BE} = 0$                        | –    | 15   | V                |
| $V_{EBO}$ | emitter-base voltage           | open collector                      | –    | 2    | V                |
| $I_C$     | collector current (DC)         |                                     | –    | 120  | mA               |
| $P_{tot}$ | total power dissipation        | $T_s \leq 60\text{ }^\circ\text{C}$ | –    | 1.2  | W                |
| $T_{stg}$ | storage temperature            |                                     | –65  | +150 | $^\circ\text{C}$ |
| $T_j$     | operating junction temperature |                                     | –    | 175  | $^\circ\text{C}$ |

**THERMAL CHARACTERISTICS**

| SYMBOL        | PARAMETER   | CONDITIONS  | VALUE | UNIT |
|---------------|---|---|-------|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | $T_s \leq 60\text{ }^\circ\text{C}; P_{tot} = 1.2\text{ W}$ | 95    | K/W  |



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## CHARACTERISTICS

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

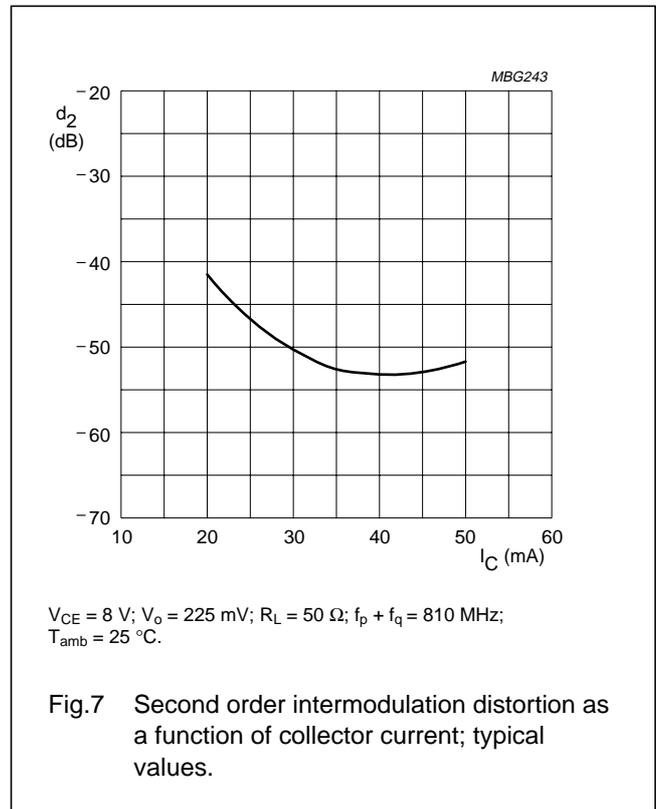
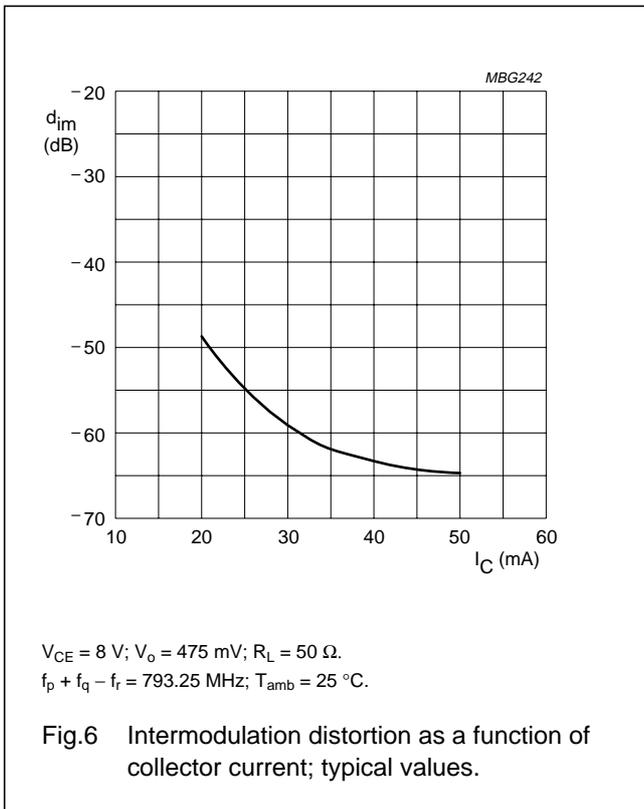
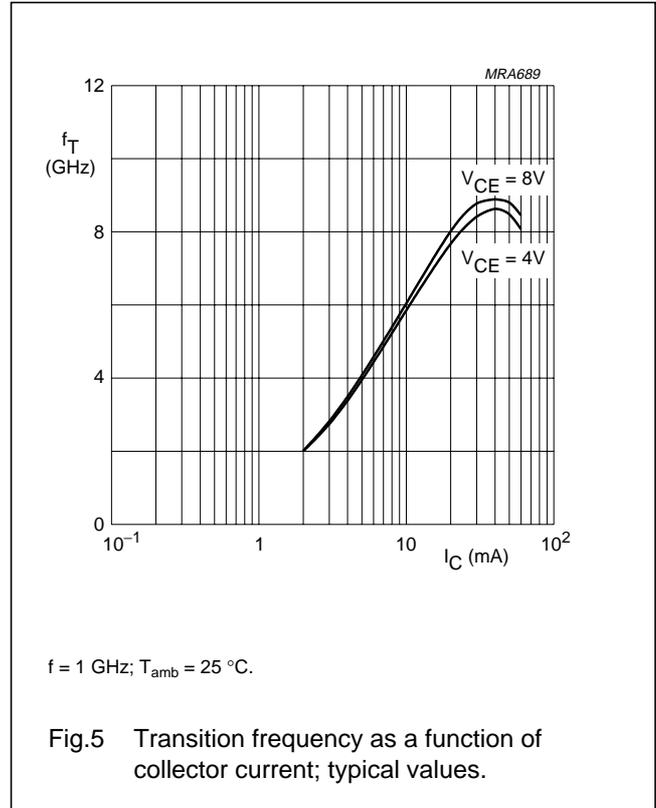
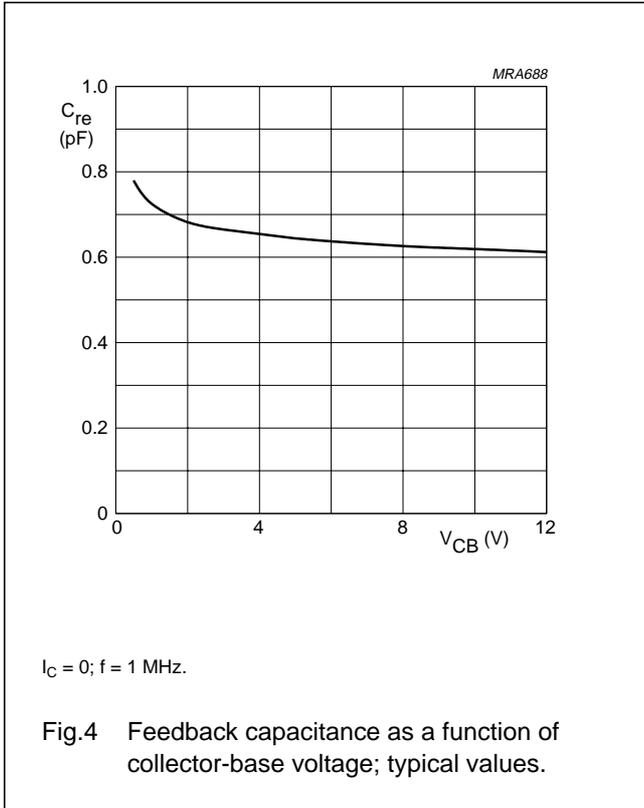
| SYMBOL        | PARAMETER                               | CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
|---------------|---|---|------|------|------|------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage        | open emitter; $I_C = 10\ \mu\text{A}$ ; $I_E = 0$   | 20   | –    | –    | V    |
| $V_{(BR)CES}$ | collector-emitter breakdown voltage     | $R_{BE} = 0$ ; $I_C = 40\ \mu\text{A}$  | 15   | –    | –    | V    |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage          | $I_E = 100\ \mu\text{A}$ ; $I_C = 0$  | 2    | –    | –    | V    |
| $I_{CBO}$     | collector-base leakage current          | $V_{CB} = 8\ \text{V}$ ; $I_E = 0$  | –    | –    | 50   | nA   |
| $I_{EBO}$     | emitter-base leakage current            | $V_{CB} = 1\ \text{V}$ ; $I_C = 0$  | –    | –    | 200  | nA   |
| $h_{FE}$      | DC current gain                         | $I_C = 40\ \text{mA}$ ; $V_{CE} = 8\ \text{V}$  | 100  | 120  | 250  |      |
| $f_T$         | transition frequency                    | $I_C = 40\ \text{mA}$ ; $V_{CE} = 8\ \text{V}$ ;<br>$f_m = 1\ \text{GHz}$                             | –    | 9    | –    | GHz  |
| $C_e$         | emitter capacitance                     | $I_C = I_e = 0$ ; $V_{EB} = 0.5\ \text{V}$ ; $f = 1\ \text{MHz}$                                      | –    | 2    | –    | pF   |
| $C_{re}$      | feedback capacitance                    | $I_C = 0$ ; $V_{CE} = 8\ \text{V}$ ; $f = 1\ \text{MHz}$  | –    | 0.9  | –    | pF   |
| $ S_{21} ^2$  | insertion power gain                    | $I_C = 40\ \text{mA}$ ; $V_{CE} = 8\ \text{V}$ ;<br>$f = 900\ \text{MHz}$ ; $T_{amb} = 25\text{ °C}$  | 12   | 13   | –    | dB   |
| $V_o$         | output voltage                          | note 1  | –    | 500  | –    | mV   |
|               |   | note 2  | –    | 350  | –    | mV   |
| $d_2$         | second order intermodulation distortion | note 3  | –    | –    | –53  | dB   |
| F             | noise figure                            | $I_C = 40\ \text{mA}$ ; $V_{CE} = 8\ \text{V}$ ;<br>$f = 900\ \text{MHz}$ ; $\Gamma_S = \Gamma_{opt}$ | –    | 1.9  | 2.4  | dB   |

## Notes

- $d_{im} = -60\ \text{dB}$  (DIN45004B);  $V_{CE} = 8\ \text{V}$ ;  $I_C = 40\ \text{mA}$ ;  $R_L = 50\ \Omega$ ;  
 $V_p = V_o$ ;  $V_q = V_o - 6\ \text{dB}$ ;  $V_r = V_o - 6\ \text{dB}$ ;  
 $f_p = 795.25\ \text{MHz}$ ;  $f_q = 803.25\ \text{MHz}$ ;  $f_r = 805.5\ \text{MHz}$ ;  
measured at  $f_p + f_q - f_r = 793.25\ \text{MHz}$ .
- $d_{im} = -60\ \text{dB}$  (DIN 45004B);  $I_C = 40\ \text{mA}$ ;  $V_{CE} = 8\ \text{V}$ ;  $R_L = 50\ \Omega$ ;  
 $V_p = V_q = V_o$ ;  $f_p = 806\ \text{MHz}$ ;  $f_q = 810\ \text{MHz}$ ;  
measured at  $2f_p - f_q = 802\ \text{MHz}$ .
- $I_C = 40\ \text{mA}$ ;  $V_{CE} = 8\ \text{V}$ ;  $R_L = 50\ \Omega$ ;  
 $V_p = V_q = 225\ \text{mV}$ ;  $f_p = 250\ \text{MHz}$ ;  $f_q = 560\ \text{MHz}$ ;  
measured at  $f_p + f_q = 810\ \text{MHz}$ .

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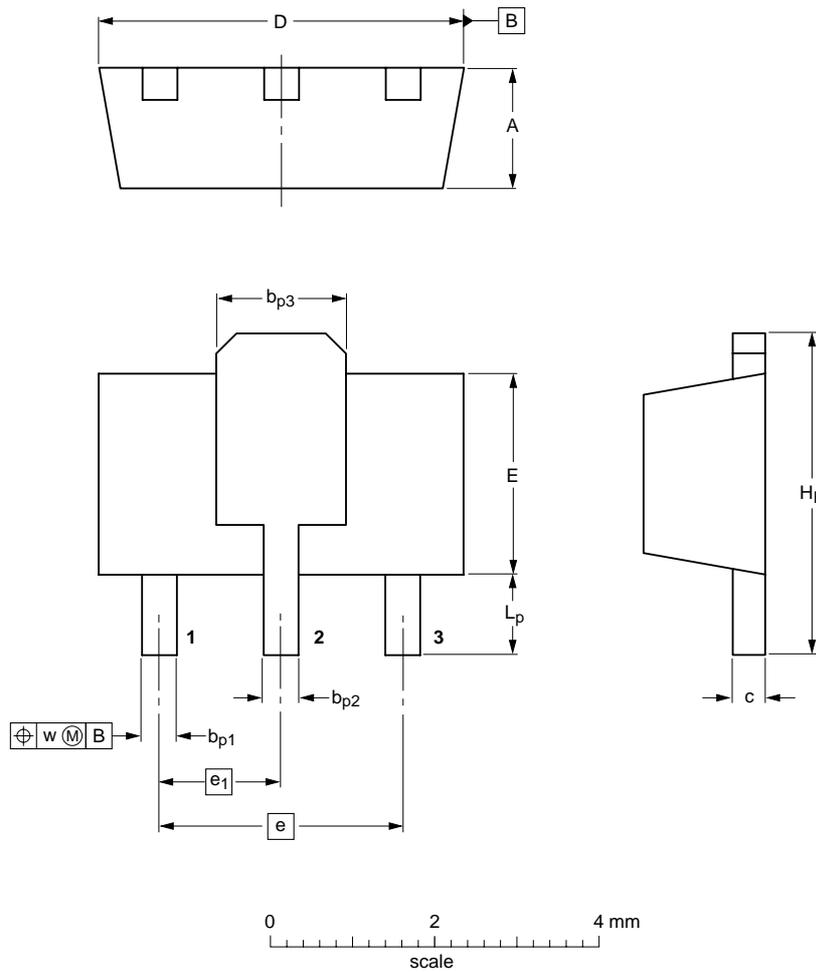
NPN wideband transistor

BFQ540

PACKAGE OUTLINE

Plastic surface-mounted package; collector pad for good heat transfer; 3 leads

SOT89



DIMENSIONS (mm are the original dimensions)

| UNIT | A   | b <sub>p1</sub> | b <sub>p2</sub> | b <sub>p3</sub> | c    | D   | E   | e   | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | w    |
|------|-----|-----------------|-----------------|-----------------|------|-----|-----|-----|----------------|----------------|----------------|------|
| mm   | 1.6 | 0.48            | 0.53            | 1.8             | 0.44 | 4.6 | 2.6 | 3.0 | 1.5            | 4.25           | 1.2            | 0.13 |
|      | 1.4 | 0.35            | 0.40            | 1.4             | 0.23 | 4.4 | 2.4 |     |                |                |                |      |

| OUTLINE VERSION | REFERENCES |        |       | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|--------|-------|---------------------|----------------------|
|                 | IEC        | JEDEC  | JEITA |                     |                      |
| SOT89           |            | TO-243 | SC-62 |                     | 06-03-16<br>06-08-29 |

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### Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition  |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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## Revision history

### Revision history

| Document ID                  | Release date                         | Data sheet status     | Change notice | Supersedes |
|------------------------------|--------------------------------------|-----------------------|---------------|------------|
| BFQ540_N_4                   | 20070925                             | Product data sheet    | -             | BFQ540_3   |
| Modifications:               | • Fig. 1 and package outline updated |                       |               |            |
| BFQ540_3<br>(9397 750 07064) | 20000523                             | Product specification | -             | BFQ540_2   |
| BFQ540_2<br>(9397 750 04296) | 19980827                             | Product specification | -             | BFQ540_1   |
| BFQ540_1                     | 19950904                             | Product specification | -             | -          |

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