

BFG540

NPN wideband transistor

Rev. 05 — 21 March 2013

Product data sheet

1. Product profile

1.1 General description

NPN wideband transistor in a SOT89 plastic package.

1.2 Features and benefits

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

1.3 Applications

- VHF, UHF and CATV amplifiers.

1.4 Quick reference data

Table 1. Quick reference data

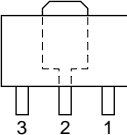
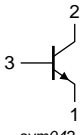
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|---------------------------|--|-----|-----|-----|------|
| V_{CBO} | collector-base voltage | open emitter | | | 20 | V |
| V_{CES} | collector-emitter voltage | $R_{BE} = 0$ | | | 15 | V |
| V_{EBO} | emitter-base voltage | open collector | | | 2.5 | V |
| I_C | collector current (DC) | | | | 120 | mA |
| P_{tot} | total power dissipation | $T_s \leq 60\text{ °C}$ | [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 |

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



2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|-------------|---|---|
| 1 | emitter |  |  sym042 |
| 2 | collector | | |
| 3 | base | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| BFQ540 | - | plastic surface-mounted package; collector pad for good heat transfer; 3 leads | SOT89 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BFQ540 | N4 |

5. Limiting values

Table 5. Limiting values

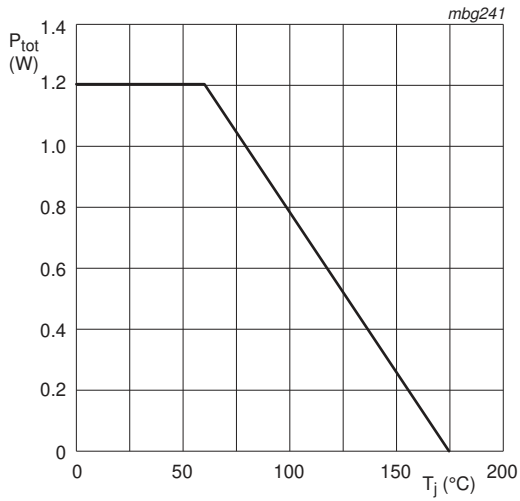
In accordance with the Absolute Maximum Rating System (IEC 60134).

| 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 | | 2.5 | V |
| I_C | collector current (DC) | | | 120 | mA |
| P_{tot} | total power dissipation | $T_s \leq 60\text{ °C}$ | | 1.2 | W |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | operating junction temperature | | | 175 | °C |

6. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|---------------|---|--|-----|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | $T_s \leq 60\text{ °C}$; $P_{tot} = 1.2\text{ W}$ | 95 | K/W |



$V_{CE} \leq 9\text{ V}$.

Fig 1. Power derating curve.

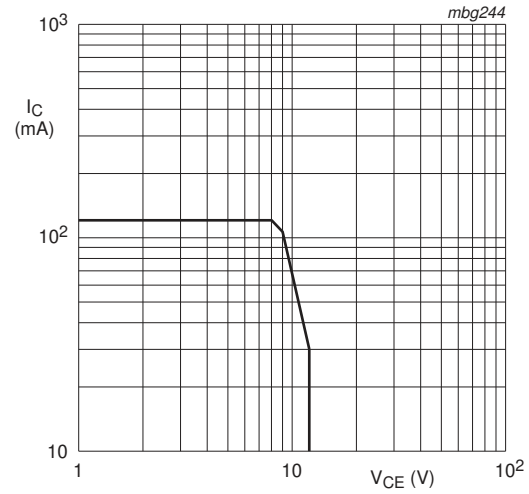


Fig 2. SOAR.

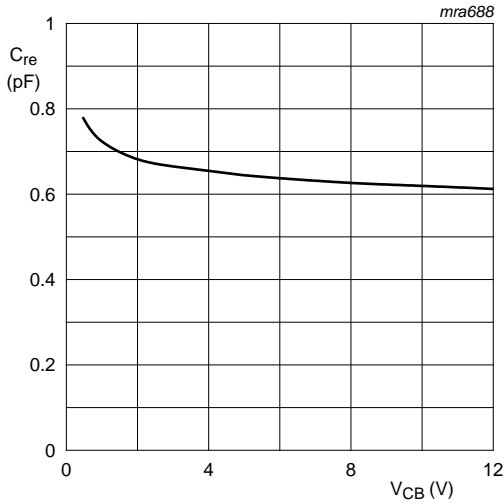
7. Characteristics

Table 7. Characteristics

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

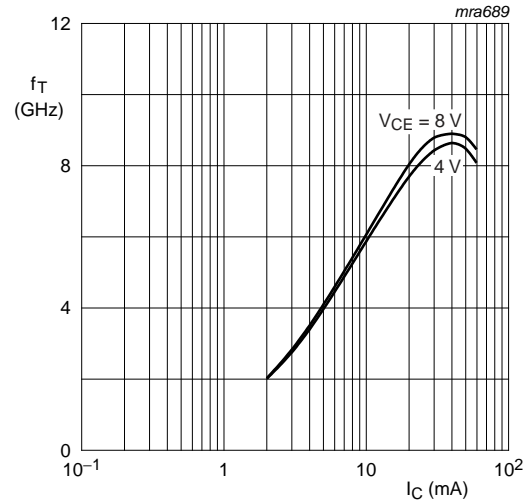
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|---|---|---------------------|-----|-----|------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | open emitter; $I_C = 10\text{ }\mu\text{A}$; $I_E = 0$ | 20 | | | V |
| $V_{(BR)CES}$ | collector-emitter breakdown voltage | $R_{BE} = 0$; $I_C = 40\text{ }\mu\text{A}$ | 15 | | | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | $I_E = 100\text{ }\mu\text{A}$; $I_C = 0$ | 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 | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f_m = 1\text{ GHz}$ | | 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 | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ °C}$ | 12 | 13 | | dB |
| V_o | output voltage | | [1] | 500 | | mV |
| | | | [2] | 350 | | mV |
| d_2 | second order intermodulation distortion | | [3] | | -53 | 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 |

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



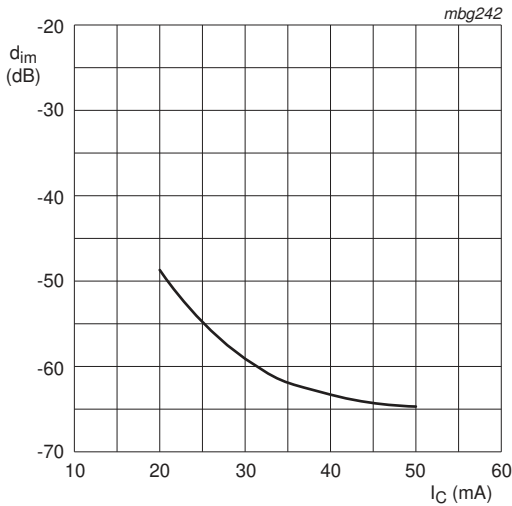
$I_C = 0$; $f = 1$ MHz.

Fig 3. Feedback capacitance as a function of collector-base voltage; typical values.



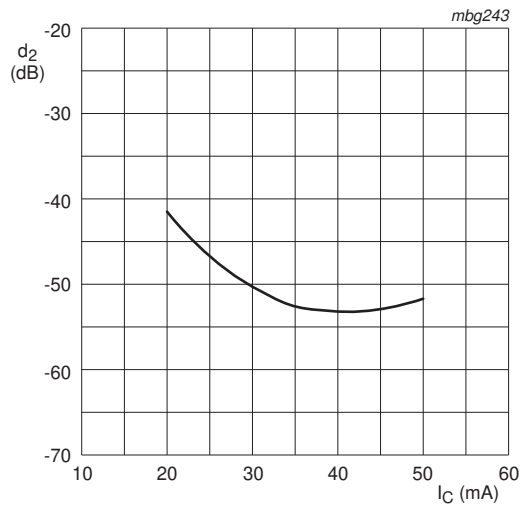
$f = 1$ GHz; $T_{amb} = 25$ °C.

Fig 4. Transition frequency as a function of collector current; typical values.



$V_{CE} = 8$ V; $V_o = 475$ mV; $R_L = 50$ Ω . $f_p + f_q - f_r = 793.25$ MHz; $T_{amb} = 25$ °C.

Fig 5. Intermodulation distortion as a function of collector current; typical values.



$V_{CE} = 8$ V; $V_o = 225$ mV; $R_L = 50$ Ω ; $f_p + f_q = 810$ MHz; $T_{amb} = 25$ °C.

Fig 6. Second order intermodulation distortion as a function of collector current; typical values.

8. Package outline

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

SOT89

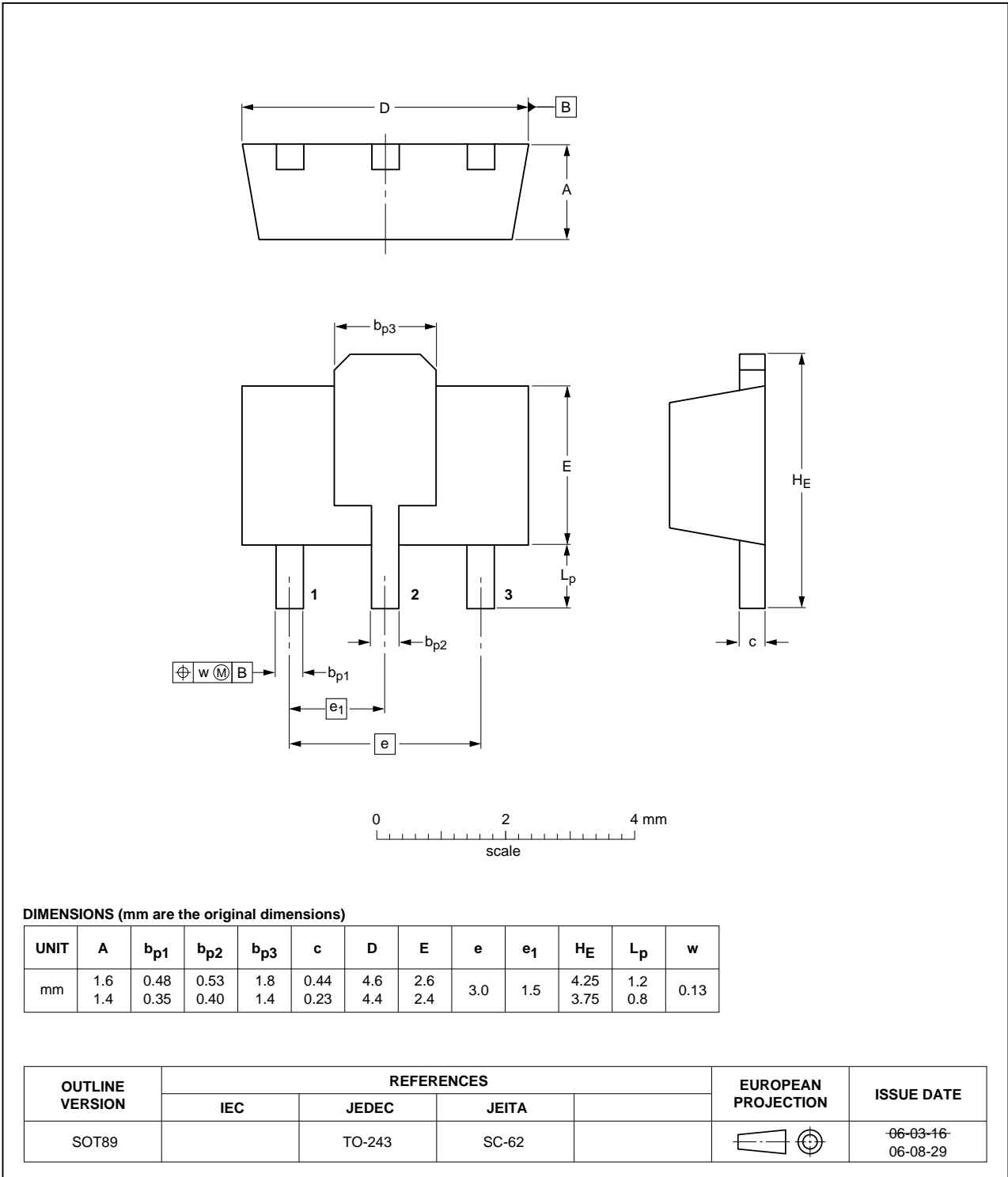


Fig 7. Package outline SOT89 (TO-243).

9. Revision history

Table 8. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------------------|--------------|--|---------------|------------|
| BFQ540 v.5 | 20130321 | Product data sheet | - | BFQ540_N_4 |
| Modifications: | | <ul style="list-style-type: none">• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.• Legal texts have been adapted to the new company name where appropriate.• Package outline drawings have been updated to the latest version.• V_{EBO} value updated. | | |
| BFQ540_N_4 | 20070925 | Product data sheet | - | BFQ540_3 |
| BFQ540_3 (9397 750 07064) | 20000523 | Product specification | | BFQ540_2 |
| BFQ540_2 (9397 750 04296) | 19980827 | Product specification | | BFQ540_1 |
| BFQ540_1 | 19950904 | Product specification | | - |

10. Legal information

10.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | 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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