

# Bfq540

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

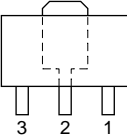
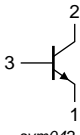
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter			20	V
$V_{CES}$	collector-emitter voltage	$R_{BE} = 0$			15	V
$V_{EBO}$	emitter-base voltage	open collector			2.5	V
$I_C$	collector current (DC)				120	mA
$P_{tot}$	total power dissipation	$T_s \leq 60\text{ °C}$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

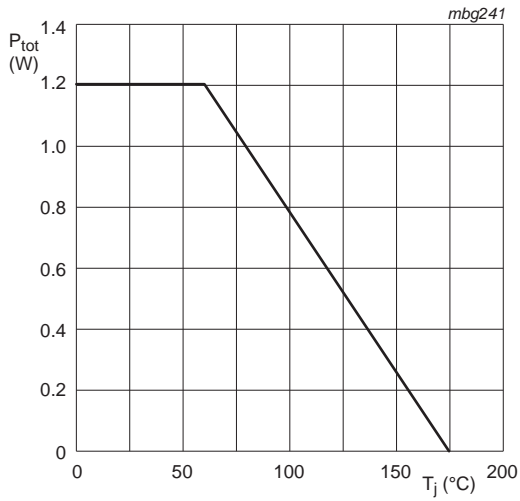
In accordance with the Absolute Maximum Rating System (IEC 60134).

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

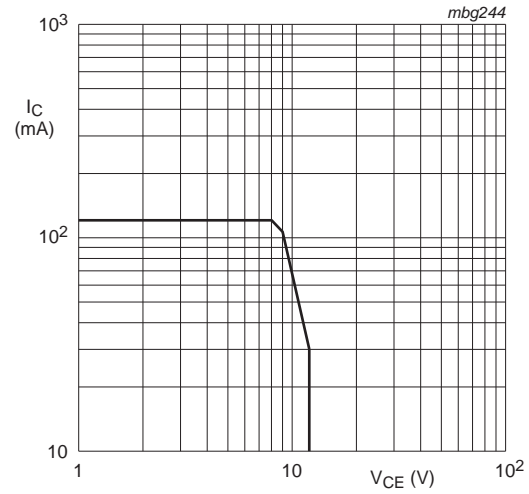
Table 6. Thermal characteristics

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.**

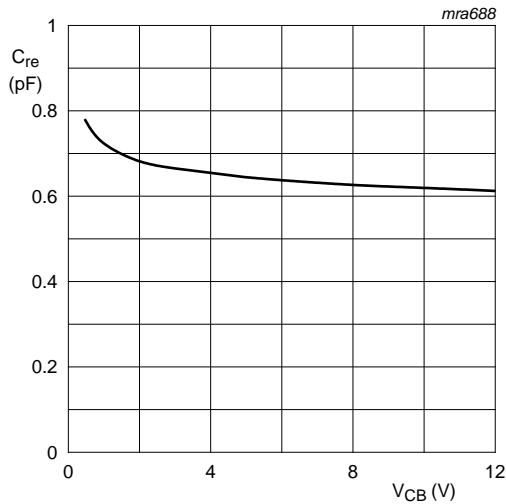
## 7. Characteristics

**Table 7. Characteristics**

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

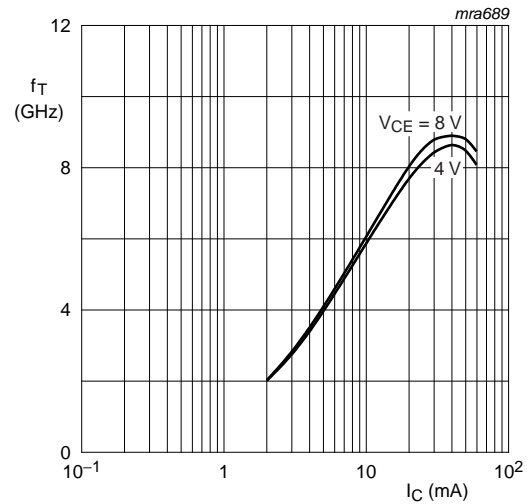
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 10\text{ }\mu\text{A}$ ; $I_E = 0$	20			V
$V_{(BR)CES}$	collector-emitter breakdown voltage	$R_{BE} = 0$ ; $I_C = 40\text{ }\mu\text{A}$	15			V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\text{ }\mu\text{A}$ ; $I_C = 0$	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		<a href="#">[1]</a>	500		mV
			<a href="#">[2]</a>	350		mV
$d_2$	second order intermodulation distortion		<a href="#">[3]</a>		-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;  $R_L = 50$   $\Omega$ ;  $V_p = V_o$ ;  $V_q = V_o - 6$  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;  $R_L = 50$   $\Omega$ ;  $V_p = V_q = V_o$ ;  $f_p = 806$  MHz;  $f_q = 810$  MHz; measured at  $2f_p - f_q = 802$  MHz.
- [3]  $I_C = 40$  mA;  $V_{CE} = 8$  V;  $R_L = 50$   $\Omega$ ;  $V_p = V_q = 225$  mV;  $f_p = 250$  MHz;  $f_q = 560$  MHz; measured at  $f_p + f_q = 810$  MHz.



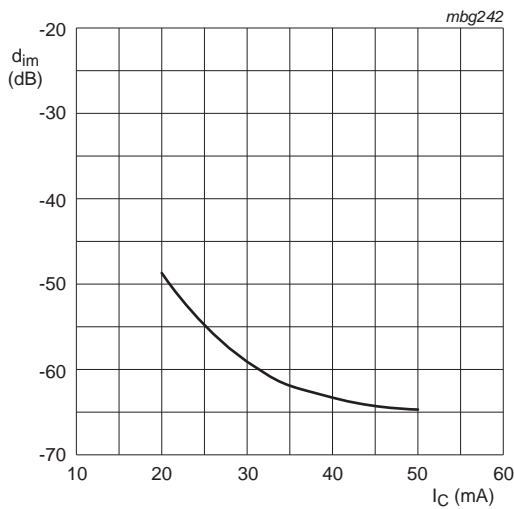
$I_C = 0$ ;  $f = 1$  MHz.

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



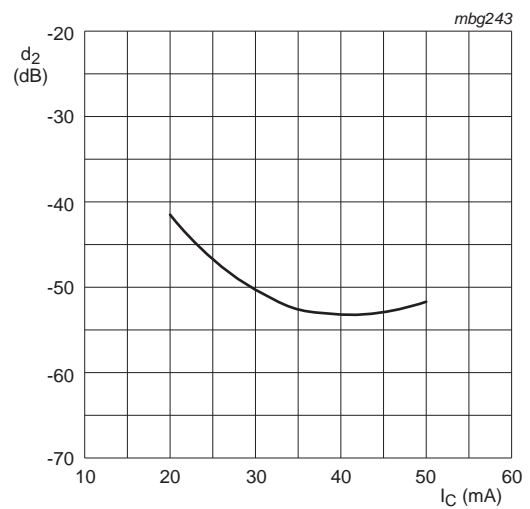
$f = 1$  GHz;  $T_{amb} = 25$  °C.

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



$V_{CE} = 8$  V;  $V_o = 475$  mV;  $R_L = 50$   $\Omega$ .  $f_p + f_q - f_r = 793.25$  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;  $R_L = 50$   $\Omega$ ;  $f_p + f_q = 810$  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

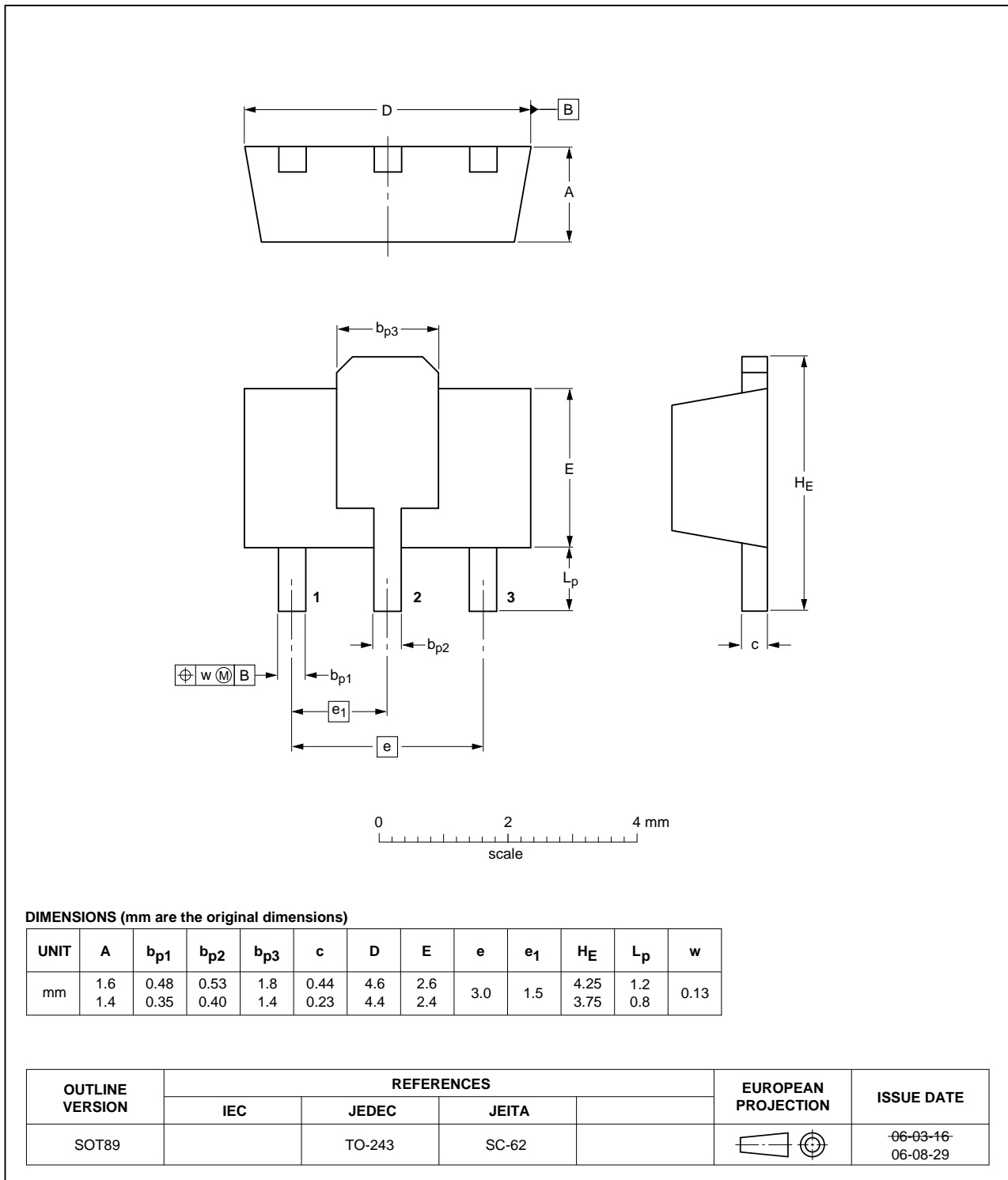


Fig 7. Package outline SOT89 (TO-243).

## 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"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Package outline drawings have been updated to the latest version.</li><li>• <math>V_{EBO}</math> value updated.</li></ul>		
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 <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.

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