

BFAQ540

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

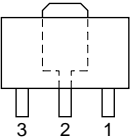
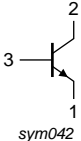
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CBO}	collector-base voltage	open emitter			20	V
V_{CES}	collector-emitter voltage	$R_{BE} = 0$			15	V
V_{EBO}	emitter-base voltage	open collector			2.5	V
I_C	collector current (DC)				120	mA
P_{tot}	total power dissipation	$T_s \leq 60\text{ °C}$	[1]		1.2	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		
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

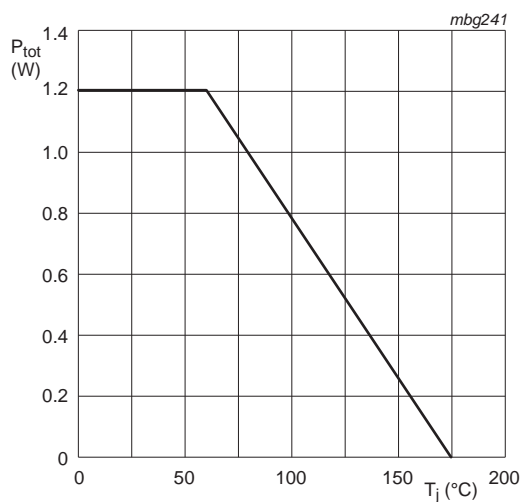

 $V_{CE} \leq 9 \text{ V.}$

Fig 1. Power derating curve.

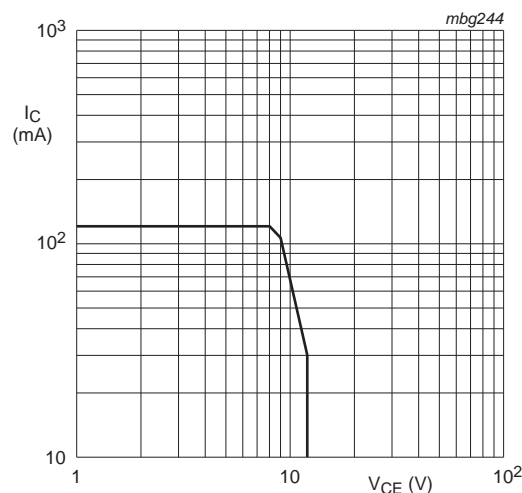


Fig 2. SOAR.

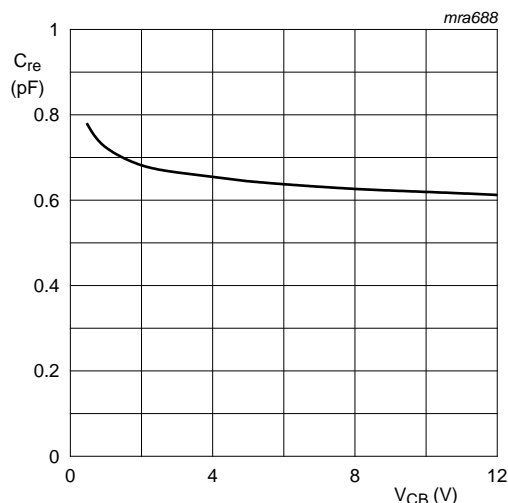
7. Characteristics

Table 7. Characteristics

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

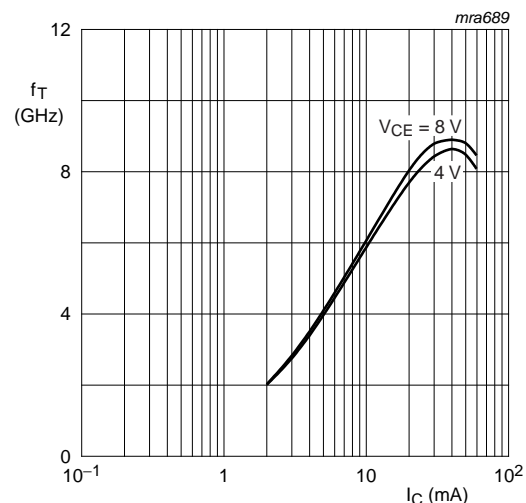
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 10 \text{ }\mu\text{A}$; $I_E = 0$	20			V
$V_{(BR)CES}$	collector-emitter breakdown voltage	$R_{BE} = 0$; $I_C = 40 \text{ }\mu\text{A}$	15			V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100 \text{ }\mu\text{A}$; $I_C = 0$	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	$I_C = 40 \text{ mA}$; $V_{CE} = 8 \text{ V}$; $f = 900 \text{ MHz}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	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.



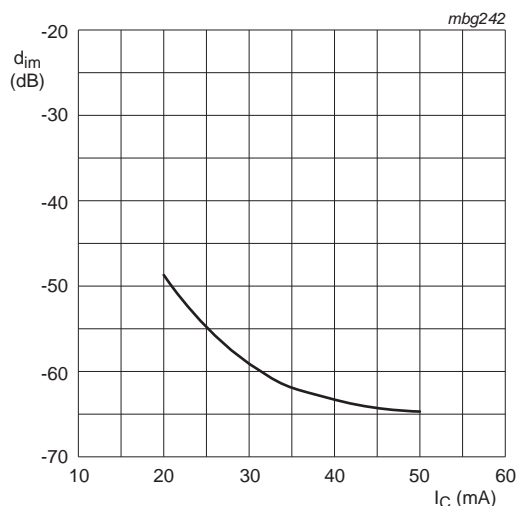
$I_C = 0$; $f = 1$ MHz.

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



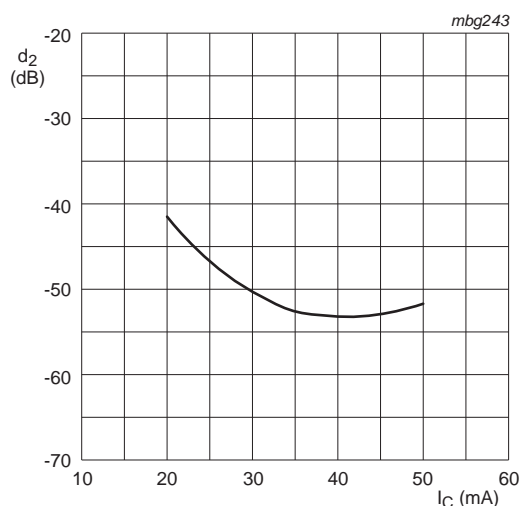
$f = 1$ GHz; $T_{amb} = 25$ $^{\circ}$ C.

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; $T_{amb} = 25$ $^{\circ}$ C.

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



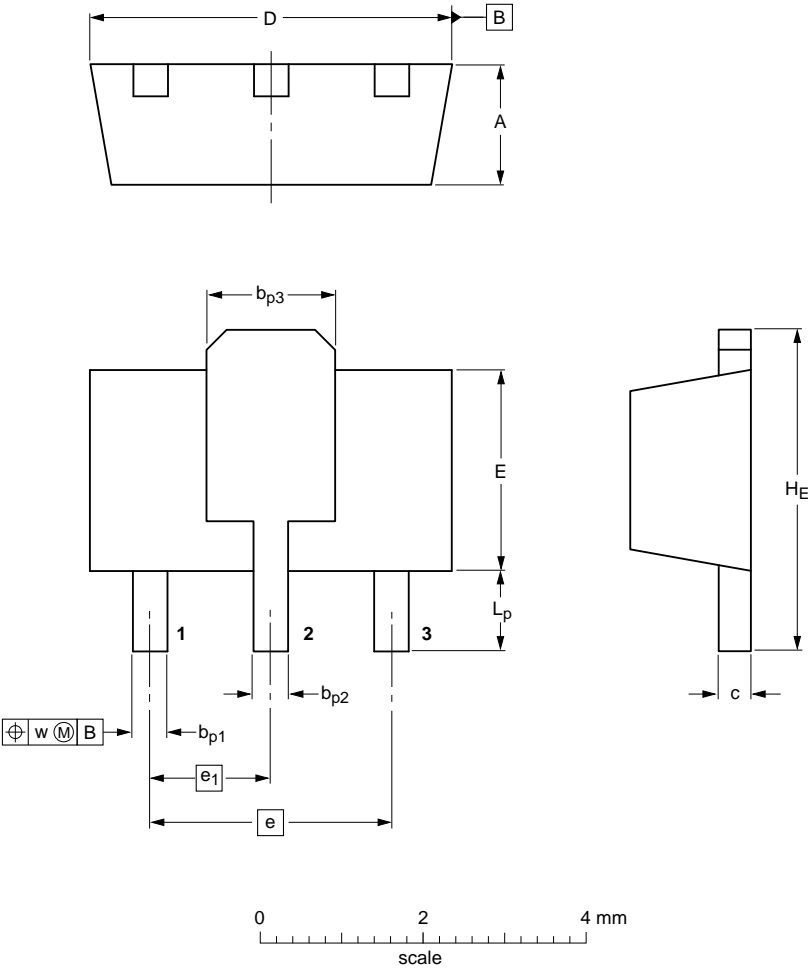
$V_{CE} = 8$ V; $V_o = 225$ mV; $R_L = 50$ Ω ; $f_p + f_q = 810$ MHz; $T_{amb} = 25$ $^{\circ}$ C.

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



DIMENSIONS (mm are the original dimensions)

UNIT	A	b _{p1}	b _{p2}	b _{p3}	c	D	E	e	e ₁	H _E	L _p	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.23	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	1.2 0.8	0.13


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

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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