

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

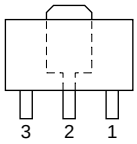
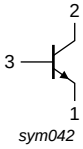
Table 1. Quick reference data

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	$T_s \leq 60$ °C	[1]			1.2	W
h_{FE}	DC current gain	I_C = 40 mA; V_{CE} = 8 V; T_j = 25 °C		100	120	250	
f_T	transition frequency	I_C = 40 mA; V_{CE} = 8 V; f = 1 GHz; T_{amb} = 25 °C			9		GHz
$\lvert s_{21}\rvert^2$	insertion power gain	I_C = 40 mA; V_{CE} = 8 V; f = 900 MHz; T_{amb} = 25 °C		12	13		dB
F	noise figure	I_C = 40 mA; V_{CE} = 8 V; f = 900 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		

sym042

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	$T_s \leq 60$ °C		1.2	W
T_{stg}	storage temperature		−65	+150	°C
T_j	operating junction temperature			175	°C

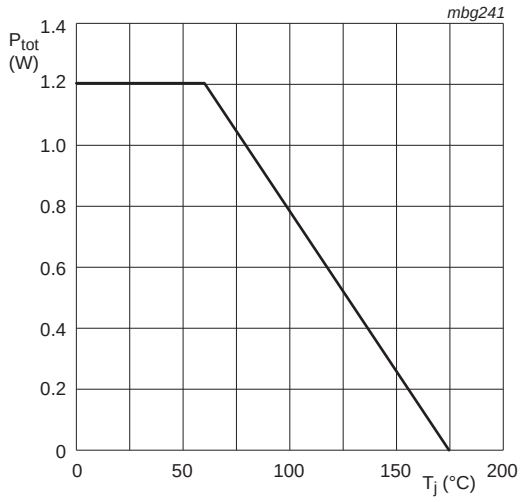
6. Thermal characteristics

Table 6. Thermal characteristics

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

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$V_{CE} \leq 9$ V.

Fig 1. Power derating curve.

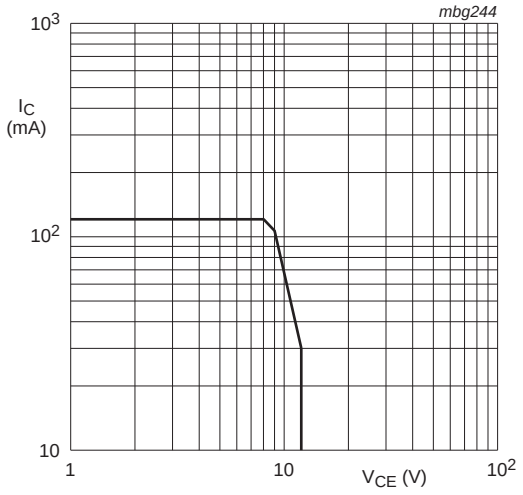


Fig 2. SOAR.

7. Characteristics

Table 7. Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 10 μA; I_E = 0		20			V
$V_{(BR)CES}$	collector-emitter breakdown voltage	R_{BE} = 0; I_C = 40 μA		15			V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 100 μA; I_C = 0		2			V
I_{CBO}	collector-base leakage current	V_{CB} = 8 V; I_E = 0				50	nA
I_{EBO}	emitter-base leakage current	V_{CB} = 1 V; I_C = 0				200	nA
h_{FE}	DC current gain	I_C = 40 mA; V_{CE} = 8 V		100	120	250	
f_T	transition frequency	I_C = 40 mA; V_{CE} = 8 V; f_m = 1 GHz			9		GHz
C_e	emitter capacitance	$I_C = i_e$ = 0; V_{EB} = 0.5 V; f = 1 MHz			2		pF
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 8 V; f = 1 MHz			0.9		pF
$\|s_{21}\|^2$	insertion power gain	I_C = 40 mA; V_{CE} = 8 V; f = 900 MHz; T_{amb} = 25 °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 mA; VCE = 8 V; f = 900 MHz; $\Gamma_S = \Gamma_{opt}$			1.9	2.4	dB

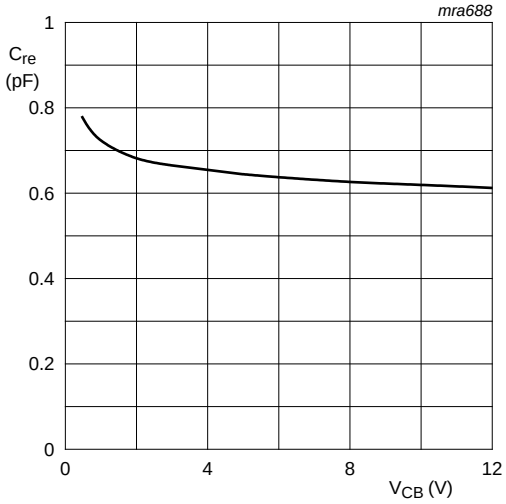
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[1] d_{im} = −60 dB (DIN45004B); V_{CE} = 8 V; I_C = 40 mA; R_L = 50 Ω; $V_p = V_o$; $V_q = V_o$ −6 dB; $V_r = V_o$ −6 dB; f_p = 795.25 MHz; f_q = 803.25 MHz; f_r = 805.5 MHz; measured at $f_p + f_q - f_r$ = 793.25 MHz.

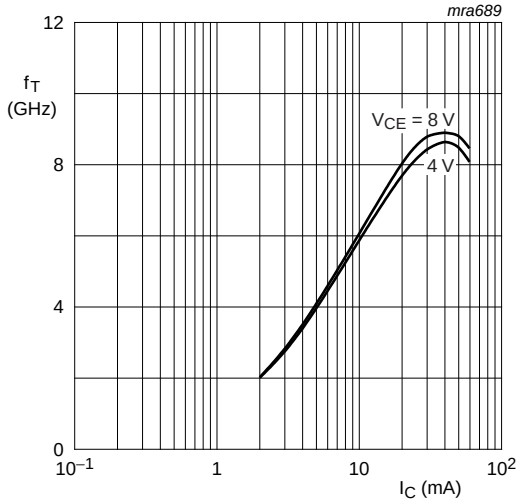
[2] d_{im} = −60 dB (DIN 45004B); I_C = 40 mA; V_{CE} = 8 V; R_L = 50 Ω; $V_p = V_q = V_o$; f_p = 806 MHz; f_q = 810 MHz; measured at $2f_p - f_q$ = 802 MHz.

[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.



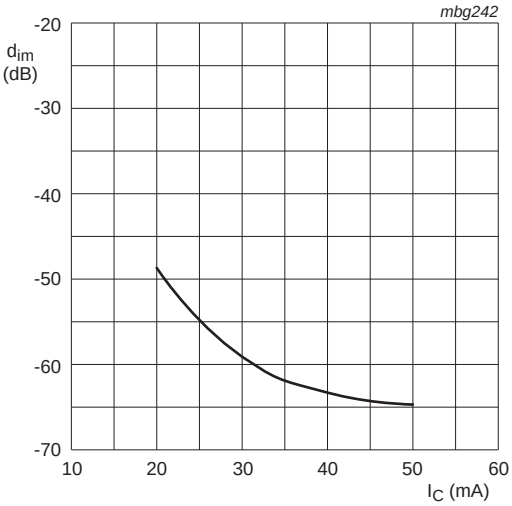
I_C = 0; f = 1 MHz.

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



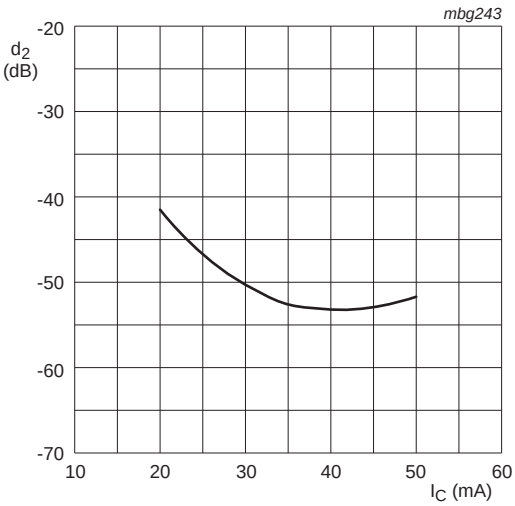
f = 1 GHz; T_{amb} = 25 °C.

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.

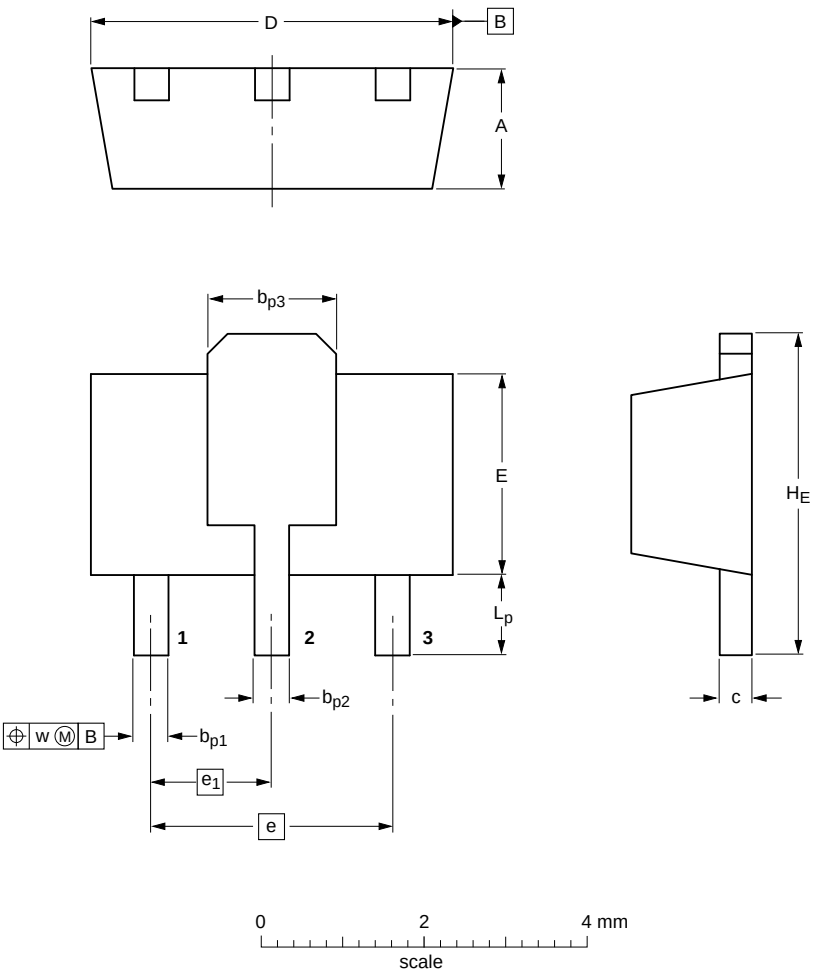
Fig 6. Second order intermodulation distortion as a function of collector current; typical values.

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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).

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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:	• 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		-

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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.

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

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