DATA SHEET

BFQ540
NPN 9 GHz wideband transistor

Product specification
File under Discrete Semiconductors, SC14

1995 Sep 04

Philips
Semiconductors

PHILIPS

NPN 9 GHz 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

Silicon NPN transistor in a plastic SOT89 package.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector

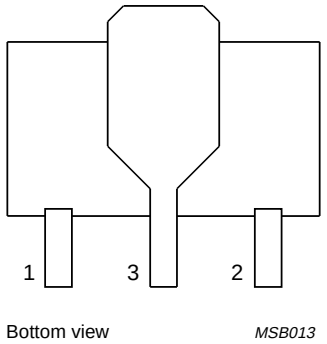


Fig.1 SOT89.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	–	12	V
V_{EBO}	collector-base voltage	open collector	–	–	2	V
I_C	DC collector current		–	–	120	mA
P_{tot}	total power dissipation	up to T_s = 60 °C; note 1	–	–	1.2	W
h_{FE}	DC current gain	I_C = 40 mA; V_{CE} = 8 V; T_j = 25 °C	60	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

Note

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

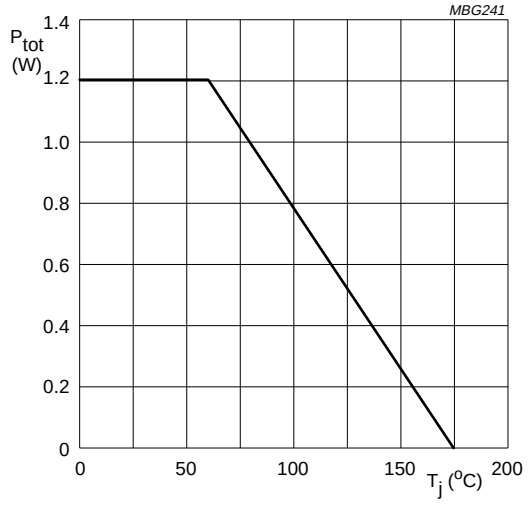
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	12	V
V_{EBO}	emitter-base voltage	open collector	–	2	V
I_C	DC collector current		–	120	mA
P_{tot}	total power dissipation	up to T_s = 60 °C	–	1.2	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	175	°C

THERMAL CHARACTERISTICS

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



$V_{CE} \leq 9$ V.

Fig.2 Power derating curve.

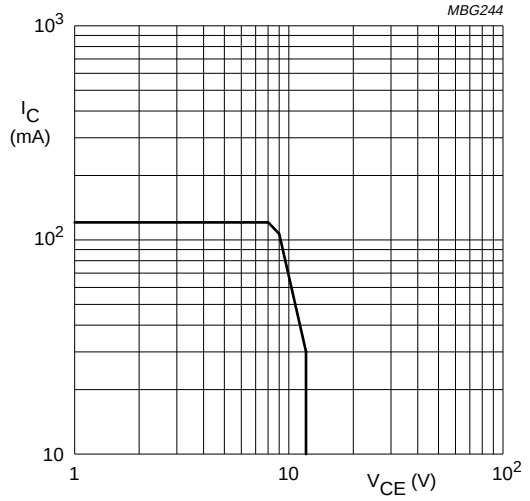


Fig.3 SOAR.

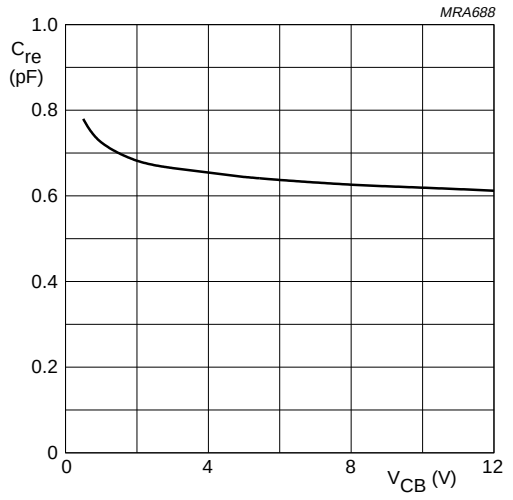
CHARACTERISTICS

T_j = 25 °C (unless otherwise specified).

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 10 μA; I_E = 0	–	–	20	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 10 mA; I_B = 0	–	–	12	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 10 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	60	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
$\lvert s_{21}\rvert^2$	insertion power gain	I_C = 40 mA; V_{CE} = 8 V; f = 900 MHz; T_{amb} = 25 °C	12	13	–	dB
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 mA; V_{CE} = 8 V; f = 900 MHz; $\Gamma_S = \Gamma_{opt}$	–	1.9	2.4	dB

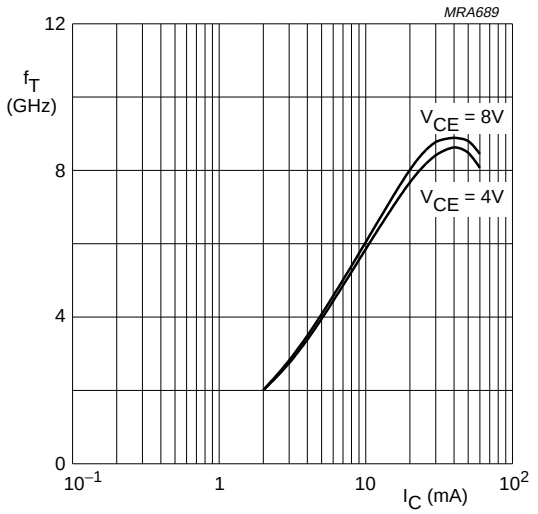
Notes

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 $f_{(p+q-r)}$ = 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 $f_{(2p-q)}$ = 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 $f_{(p+q)}$ = 810 MHz.



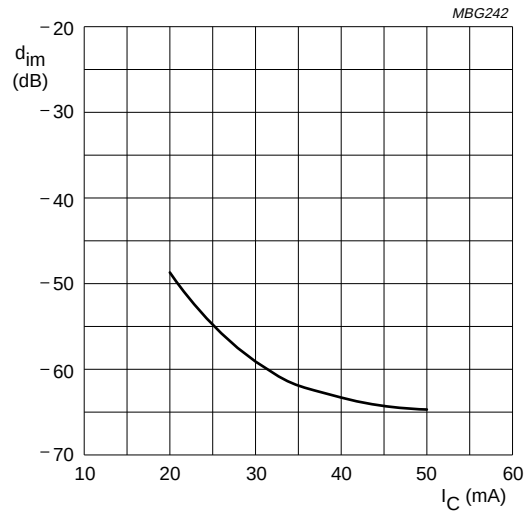
I_C = 0; f = 1 MHz.

Fig.4 Feedback capacitance as a function of collector-base voltage; typical values.



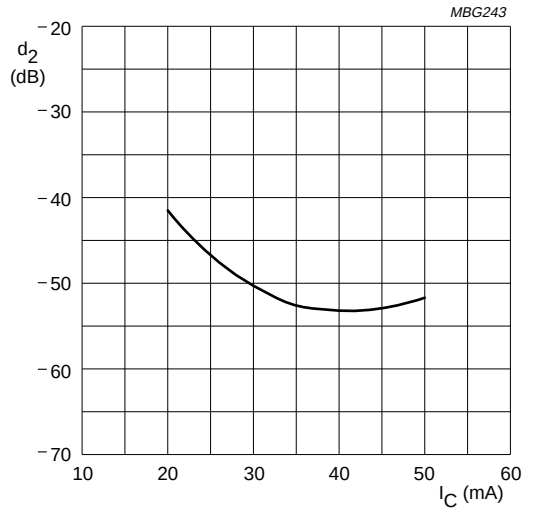
f = 1 GHz; T_{amb} = 25 °C.

Fig.5 Transition frequency as a function of collector current; typical values.



V_{CE} = 8 V; V_o = 475 mV; R_L = 50 Ω.
$f_{(p+q-r)}$ = 793.25 MHz; T_{amb} = 25 °C.

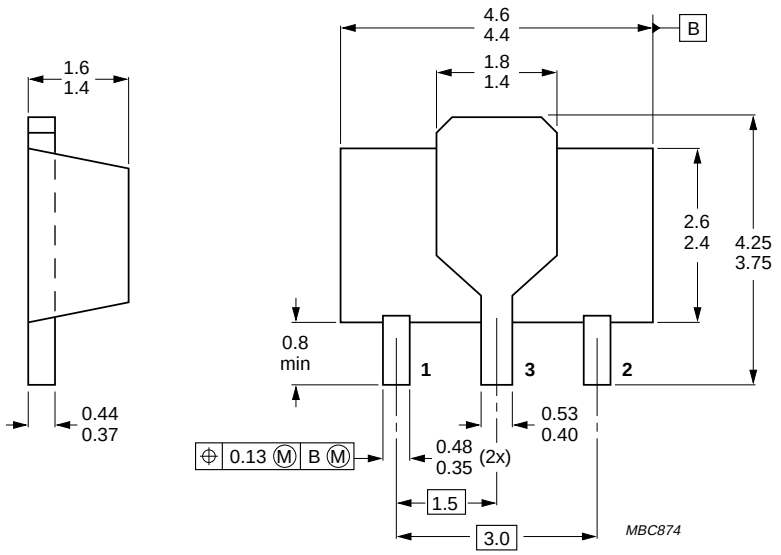
Fig.6 Intermodulation distortion as a function of collector current; typical values.



V_{CE} = 8 V; V_o = 225 mV; R_L = 50 Ω; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C.

Fig.7 Second order intermodulation distortion as a function of collector current; typical values.

PACKAGE OUTLINE



Dimensions in mm.

Fig.8 SOT89.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Short-form specification	The data in this specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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