

BFG10; BFG10/X

NPN 2 GHz RF power transistor

Rev. 05 — 22 November 2007

Product data sheet

IMPORTANT NOTICE

Dear customer,

As from October 1st, 2006 Philips Semiconductors has a new trade name - NXP Semiconductors, which will be used in future data sheets together with new contact details.

In data sheets where the previous Philips references remain, please use the new links as shown below.

<http://www.philips.semiconductors.com> use <http://www.nxp.com>

<http://www.semiconductors.philips.com> use <http://www.nxp.com> (Internet)

sales.addresses@www.semiconductors.philips.com use salesaddresses@nxp.com (email)

The copyright notice at the bottom of each page (or elsewhere in the document, depending on the version)

- © Koninklijke Philips Electronics N.V. (year). All rights reserved -

is replaced with:

- © NXP B.V. (year). All rights reserved. -

If you have any questions related to the data sheet, please contact our nearest sales office via e-mail or phone (details via salesaddresses@nxp.com). Thank you for your cooperation and understanding,

NXP Semiconductors

NPN 2 GHz RF power transistor

BFG10; BFG10/X

FEATURES

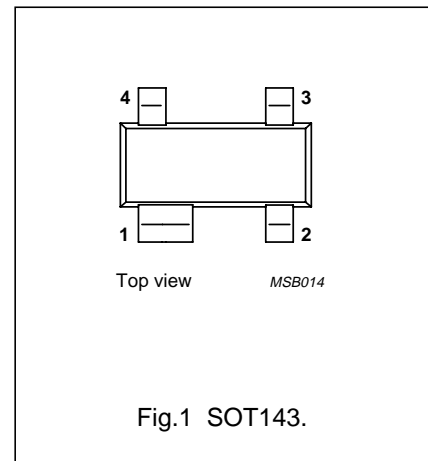
- High power gain
- High efficiency
- Small size discrete power amplifier
- 1.9 GHz operating area
- Gold metallization ensures excellent reliability.

APPLICATIONS

- Common emitter class-AB operation in hand-held radio equipment at 1.9 GHz.

PINNING

PIN	DESCRIPTION
BFG10 (see Fig.1)	
1	collector
2	base
3	emitter
4	emitter
BFG10/X (see Fig.1)	
1	collector
2	emitter
3	base
4	emitter



DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in plastic, 4-pin dual-emitter SOT143 package.

MARKING

TYPE NUMBER	CODE
BFG10	%MS
BFG10/X	%MT

QUICK REFERENCE DATA

RF performance at $T_{amb} = 25\text{ °C}$ in a common-emitter test circuit (see Fig.7).

MODE OF OPERATION	f (GHz)	V_{CE} (V)	P_L (mW)	G_p (dB)	η_c (%)
Pulsed, class-AB, duty cycle: < 1 : 8	1.9	3.6	200	≥ 5	≥ 50

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CB0}	collector-base voltage	open emitter	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	8	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	250	mA
$I_{C(AV)}$	average collector current		–	250	mA
P_{tot}	total power dissipation	up to $T_s = 60\text{ °C}$; see Fig.2; note 1	–	400	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	175	°C

Note

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

NPN 2 GHz RF power transistor

BFG10; BFG10/X

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	up to $T_s = 60\text{ }^\circ\text{C}$; note 1; $P_{tot} = 400\text{ mW}$	290	K/W

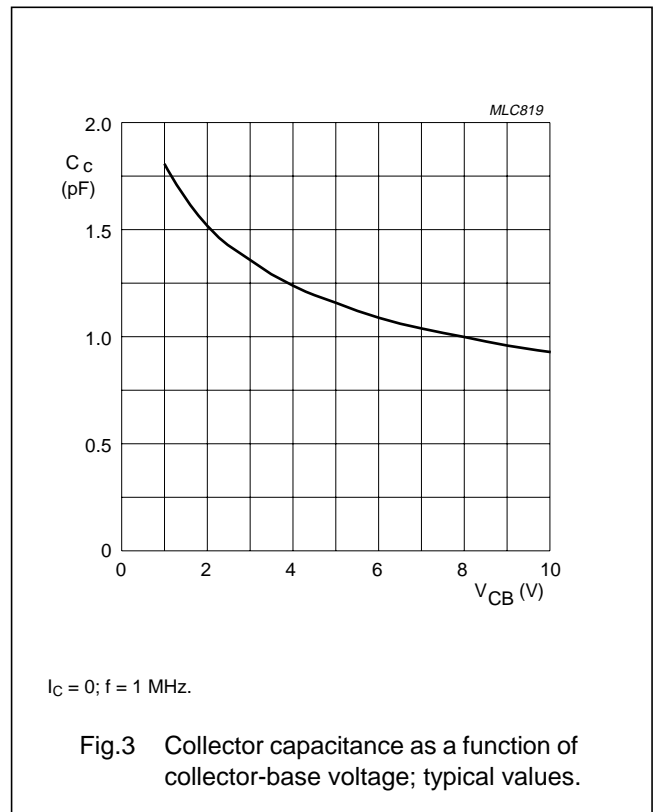
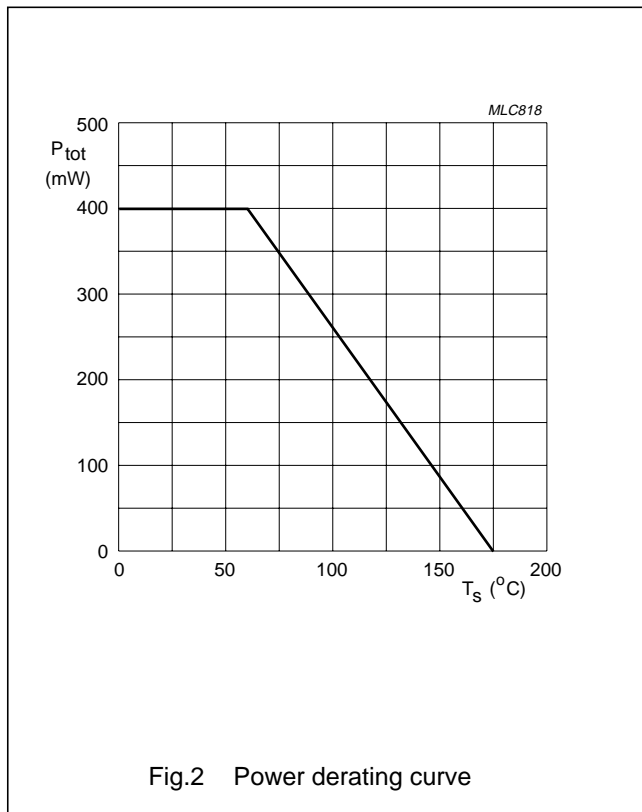
Note

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

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 0.1\text{ mA}$	20	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $I_C = 5\text{ mA}$	8	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $I_E = 0.1\text{ mA}$	2.5	–	V
I_{CES}	collector leakage current	$V_{CE} = 5\text{ V}$; $V_{BE} = 0$	–	100	μA
h_{FE}	DC current gain	$I_C = 50\text{ mA}$; $V_{CE} = 5\text{ V}$	25	–	
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 3.6\text{ V}$; $f = 1\text{ MHz}$	–	3	pF
C_{re}	feedback capacitance	$I_C = 0$; $V_{CE} = 3.6\text{ V}$; $f = 1\text{ MHz}$	–	2	pF



NPN 2 GHz RF power transistor

BFG10; BFG10/X

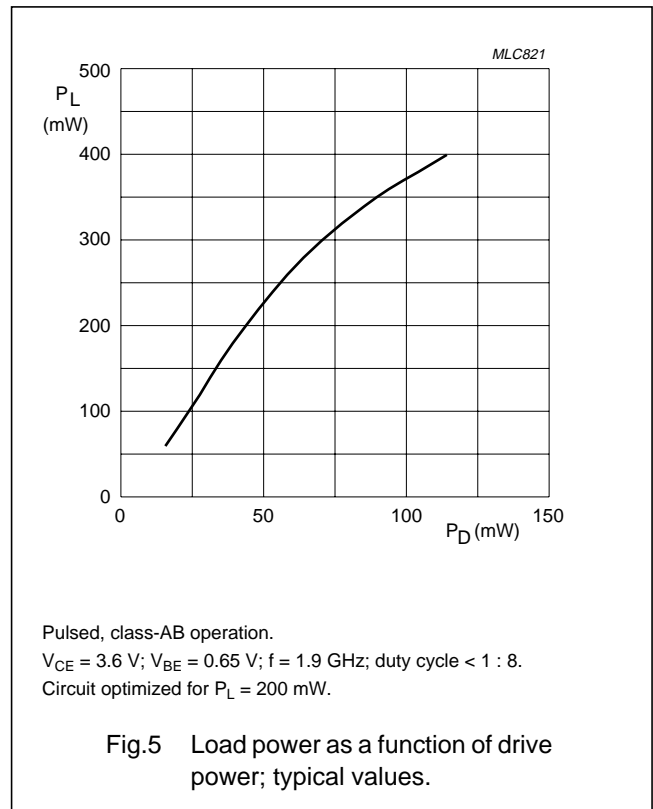
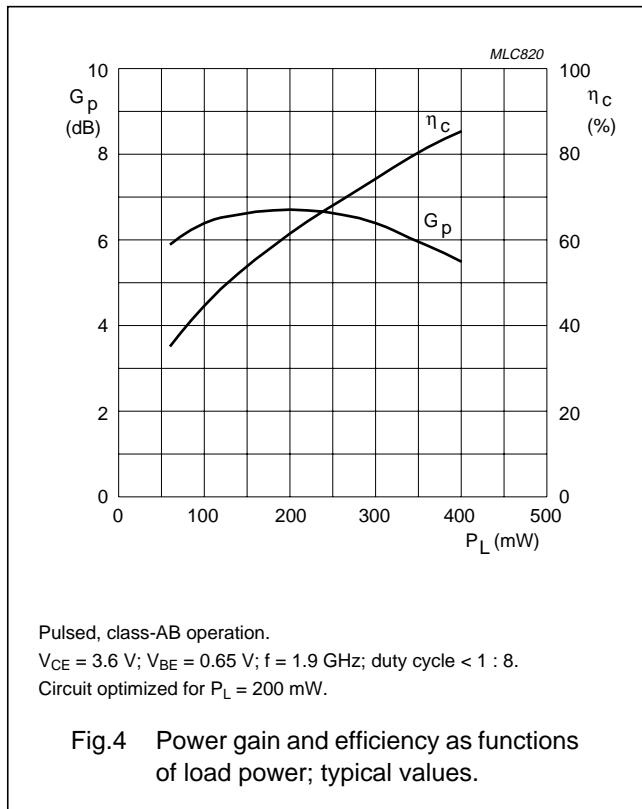
APPLICATION INFORMATION

RF performance at $T_{amb} = 25\text{ }^{\circ}\text{C}$ in a common-emitter test circuit (see Fig.7).

MODE OF OPERATION	f (GHz)	V _{CE} (V)	I _{CQ} (mA)	P _L (mW)	G _p (dB)	η_c (%)
Pulsed, class-AB, duty cycle: < 1 : 8	1.9	3.6	1	200	>5 typ. 7	>50 typ. 60

Ruggedness in class-AB operation

The BFG10 is capable of withstanding a load mismatch corresponding to VSWR = 8 : 1 through all phases, at rated output power under pulsed conditions up to a supply voltage of 7 V, f = 1.9 GHz and a duty cycle of 1 : 8.



NPN 2 GHz RF power transistor

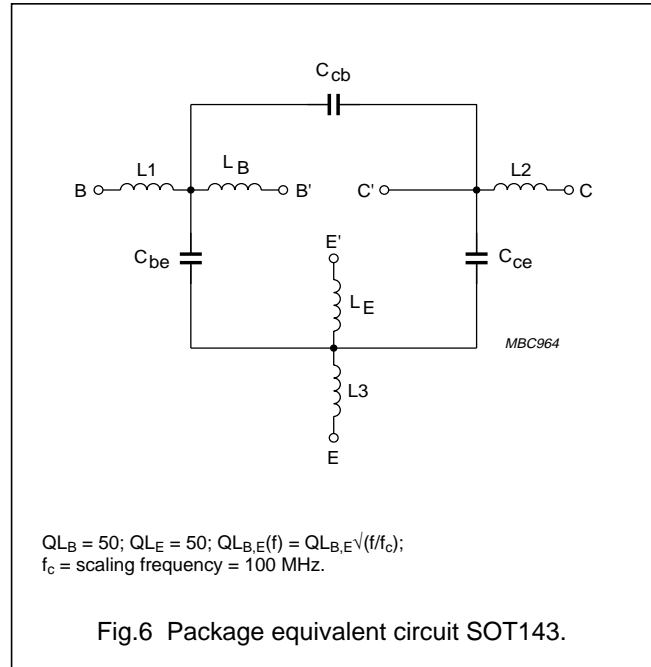
BFG10; BFG10/X

SPICE parameters for the BFG10 crystal

SEQUENCE No.	PARAMETER	VALUE	UNIT
1	IS	2.714	fA
2	BF	102.8	–
3	NF	0.998	–
4	VAF	28.12	V
5	IKF	6.009	A
6	ISE	403.2	pA
7	NE	2.937	–
8	BR	31.01	–
9	NR	0.999	–
10	VAR	2.889	V
11	IKR	0.284	A
12	ISC	1.487	fA
13	NC	1.100	–
14	RB	3.500	Ω
15	IRB	1.000	μA
16	RBM	3.500	Ω
17	RE	0.217	Ω
18	RC	0.196	Ω
19 ⁽¹⁾	XTB	0.000	–
20 ⁽¹⁾	EG	1.110	eV
21 ⁽¹⁾	XTI	3.000	–
22	CJE	5.125	pF
23	VJE	0.600	V
24	MJE	0.367	–
25	TF	12.07	ps
26	XTF	99.40	–
27	VTF	7.220	V
28	ITF	3.950	A
29	PTF	0.000	deg
30	CJC	2.327	pF
31	VJC	0.668	V
32	MJC	0.398	–
33	XCJC	0.160	–
34 ⁽¹⁾	TR	0.000	ns
35 ⁽¹⁾	CJS	0.000	F
36 ⁽¹⁾	VJS	750.0	mV
37 ⁽¹⁾	MJS	0.000	–
38	FC	0.652	–

Note

1. These parameters have not been extracted, the default values are shown.



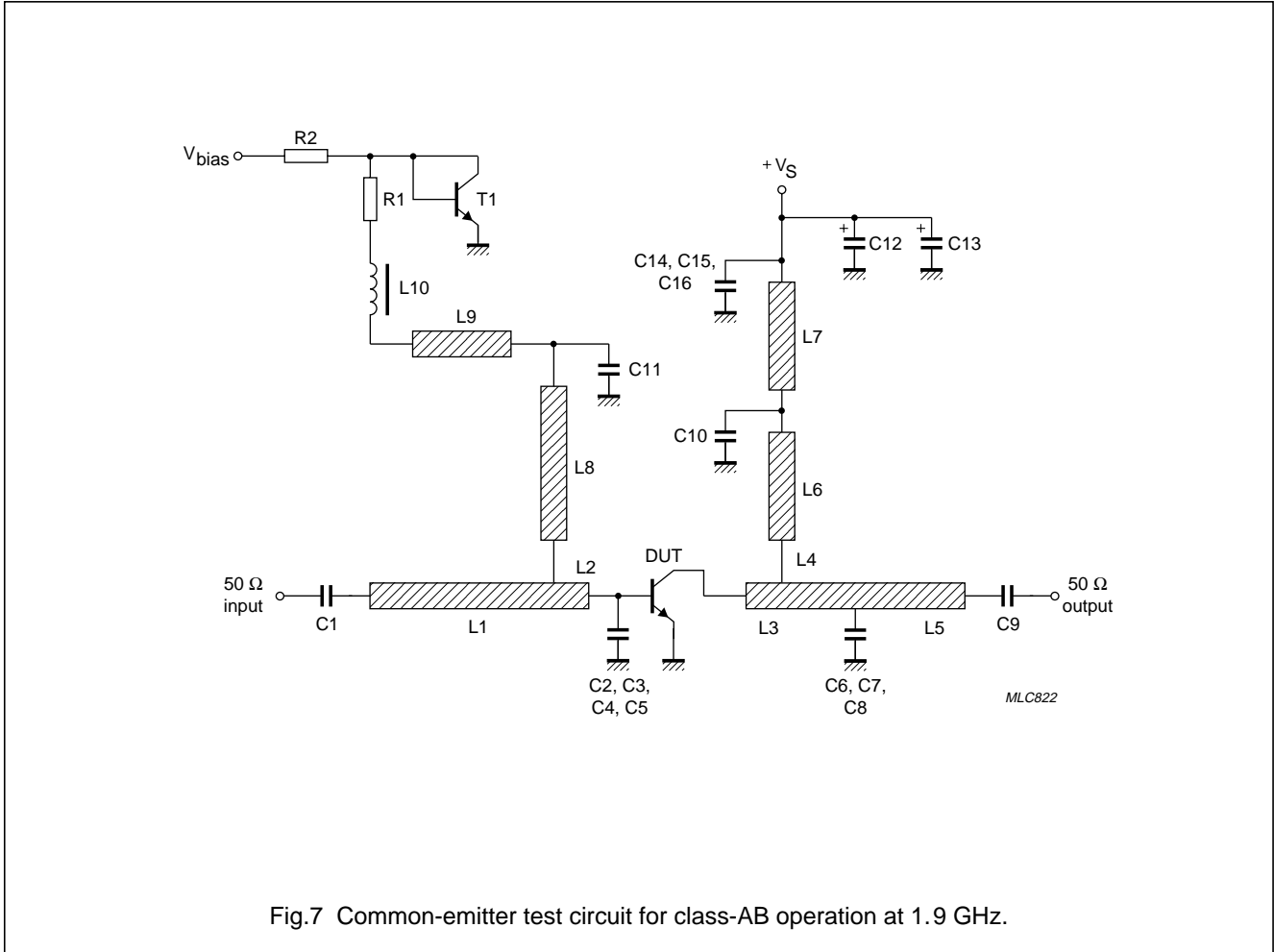
List of components (see Fig.6)

DESIGNATION	VALUE	UNIT
C_{be}	84	fF
C_{cb}	17	fF
C_{ce}	191	fF
L1	0.12	nH
L2	0.21	nH
L3	0.06	nH
L_B	0.95	nH
L_E	0.40	nH

NPN 2 GHz RF power transistor

BFG10; BFG10/X

Test circuit information



NPN 2 GHz RF power transistor

BFG10; BFG10/X

List of components used in test circuit (see Fig.7)

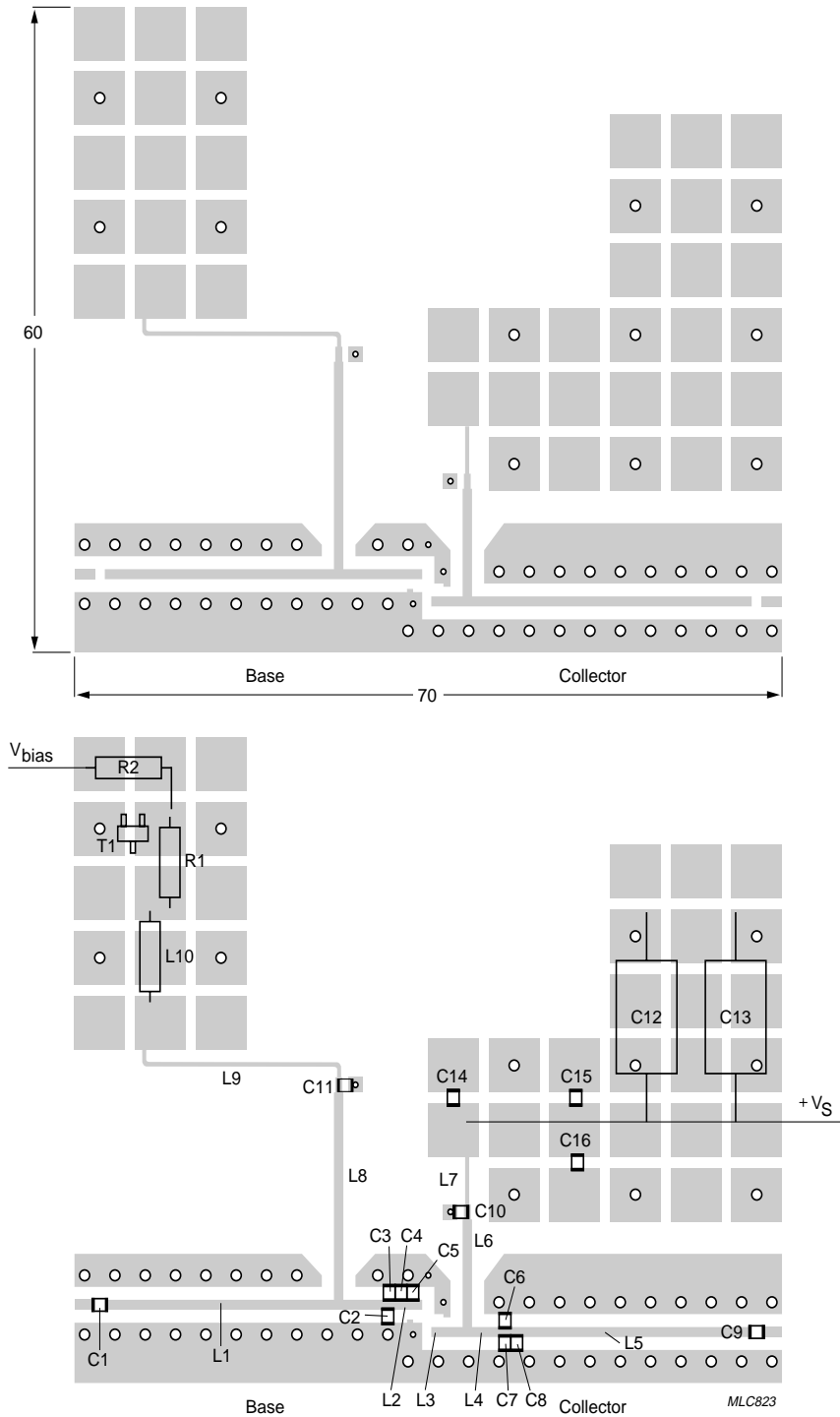
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C9, C10, C11	multilayer ceramic chip capacitor; note 1	24 pF		
C2, C3, C4, C5, C6, C7	multilayer ceramic chip capacitor; note 1	0.86 pF		
C8	multilayer ceramic chip capacitor; note 1	1.1 pF		
C12, C13	electrolytic capacitor	470 μ F; 10 V		2222 031 34471
C14, C15, C16	multilayer ceramic chip capacitor; note 1	10 nF		
L1	stripline; note 2		length 28.5 mm width 0.93 mm	
L2	stripline; note 2		length 2.3 mm width 0.93 mm	
L3	stripline; note 2		length 3.1 mm width 0.93 mm	
L4	stripline; note 2		length 3.3 mm width 0.93 mm	
L5	stripline; note 2		length 16.3 mm width 0.93 mm	
L6	stripline; note 2		length 10 mm width 0.93 mm	
L7	stripline; note 2		length 4.4 mm width 0.4 mm	
L8	stripline; note 2		length 19.3 mm width 0.93 mm	
L9	stripline; note 2		length 19.7 mm width 0.4 mm	
L10	micro choke			
T1	BD228			
R1	metal film resistor	20 Ω ; 0.4 W		2322 157 10209
R2	metal film resistor	530 Ω ; 0.4 W		2322 157 15301

Notes

1. American Technical Ceramics (ATC) capacitor, type 100A or other capacitor of the same quality.
2. The striplines are on a $\frac{1}{32}$ inch double copper-clad printed-circuit board with PTFE fibre-glass dielectric ($\epsilon_r = 6$).

NPN 2 GHz RF power transistor

BFG10; BFG10/X



Dimensions in mm.

The components are situated on one side of the copper-clad PTFE microfibre-glass board, the other side is not etched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.8 Printed-circuit board and component lay-out for common-emitter test circuit in Fig.7.

Legal information

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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Disclaimers

General — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or

malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) may cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this document is not implied. Exposure to limiting values for extended periods may affect device reliability.

Terms and conditions of sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by NXP Semiconductors. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

Contact information

For additional information, please visit: <http://www.nxp.com>

For sales office addresses, send an email to: salesaddresses@nxp.com

Revision history

Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BFG10X_N_5	20071122	Product data sheet	-	BFG10X_4
Modifications:	• Marking table on page 2; changed code			
BFG10X_4	19950831	Product specification	-	BFG10X_3
BFG10X_3	19950307	-	-	BFG10X_2
BFG10X_2	-	-	-	BFG10X_1
BFG10X_1	-	-	-	-

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

founded by

PHILIPS

© NXP B.V. 2007.

All rights reserved.

For more information, please visit: <http://www.nxp.com>


For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 22 November 2007

Document identifier: BFG10X_N_5

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View BFG10,215 on WIN SOURCE](#)

 [NXP / Nexperia Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management