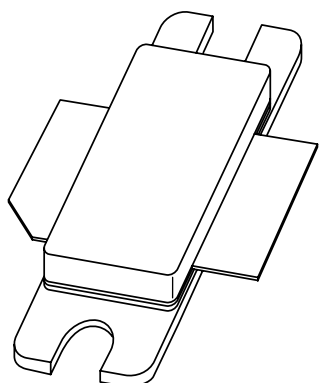


DATA SHEET



BLF2022-70 UHF power LDMOS transistor

Product specification
Supersedes data of 2001 Nov 27

2002 May 17

UHF power LDMOS transistor

BLF2022-70

FEATURES

- High power gain
- Easy power control
- Excellent ruggedness
- Designed for broadband operation (2 to 2.2 GHz)
- Internal input and output matching for high gain and efficiency.

APPLICATIONS

- Common source class-AB operation for PCN, PCS, W-CDMA, CDMA and multicarrier applications in the 2000 to 2200 MHz frequency range, operating at 28 V supply voltage.

DESCRIPTION

70 W LDMOS power transistor encapsulated in a 2-lead SOT502A flange package with a ceramic cap.

Typical W-CDMA performance for a two-carrier 3GPP W-CDMA signal (test model 1, 64 channels) with 66% clipping (peak/average ratio: 8.5 dB at 0.01% per carrier, probability on CCDF) at a supply voltage of 28 V, an I_{DQ} of 1 A and a channel bandwidth of 3.84 MHz (ACLR and d_{im3} measured in 3.84 MHz bandwidth, adjacent channels measured at ± 5 MHz):

Frequency: 2135 to 2145 MHz

Average output power: 10 W

Gain: 13 dB

Efficiency: 20%

ACLR: -40 dB

d_{im3} : -3 dBc.

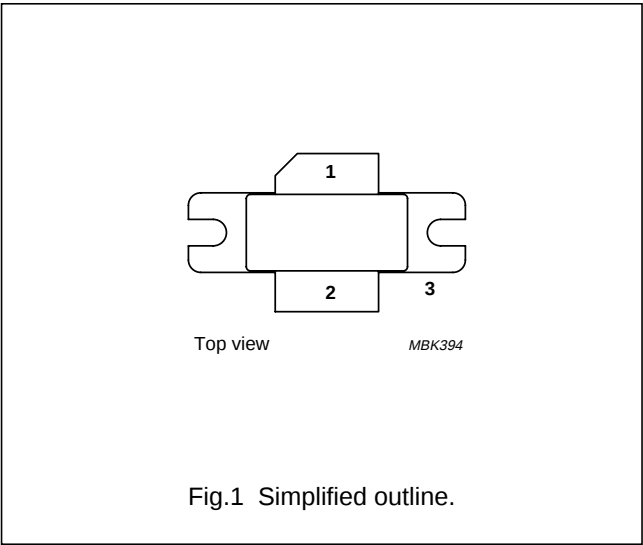
QUICK REFERENCE DATA

RF performance at $T_h = 25\text{ }^{\circ}\text{C}$ in a common source test circuit.

MODE OF OPERATION	f (MHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η_D (%)	d _{im} (dBc)
2-tone, class-AB	f ₁ = 2170; f ₂ = 2170.1	28	65 (PEP)	>11	>30	≤-25

PINNING - SOT502A

PIN	DESCRIPTION
1	drain
2	gate
3	source, connected to flange



CAUTION

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A and SNW-FQ-302B.

UHF power LDMOS transistor

BLF2022-70

LIMITING VALUES

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

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage	–	65	V
V_{GS}	gate-source voltage	–	± 15	V
I_D	DC drain current	–	9	A
T_{stg}	storage temperature	–65	+150	°C
T_j	junction temperature	–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-h}$	thermal resistance from junction to heatsink	$T_h = 25\text{ °C}$; note 1	1.15	K/W

Note

1. Determined under specified RF operating conditions.

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0$; $I_D = 1.4\text{ mA}$	65	–	–	V
V_{GSth}	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 140\text{ mA}$	4.4	–	5.5	V
I_{DSS}	drain-source leakage current	$V_{GS} = 0$; $V_{DS} = 26\text{ V}$	–	–	10	μA
I_{DSX}	on-state drain current	$V_{GS} = V_{GSth} + 9\text{ V}$; $V_{DS} = 10\text{ V}$	18	–	–	A
I_{GSS}	gate leakage current	$V_{GS} = \pm 15\text{ V}$; $V_{DS} = 0$	–	–	25	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}$; $I_D = 5\text{ A}$	–	4.2	–	S
R_{DSon}	drain-source on-state resistance	$V_{GS} = V_{GSth} + 9\text{ V}$; $I_D = 5\text{ A}$	–	0.15	–	Ω
C_{rs}	feedback capacitance	$V_{GS} = 0$; $V_{DS} = 26\text{ V}$; $f = 1\text{ MHz}$	–	3.4	–	pF

APPLICATION INFORMATION

RF performance in a common source class-AB circuit. $T_h = 25\text{ °C}$; $R_{th\ j-h} = 1.15\text{ K/W}$; unless otherwise specified.

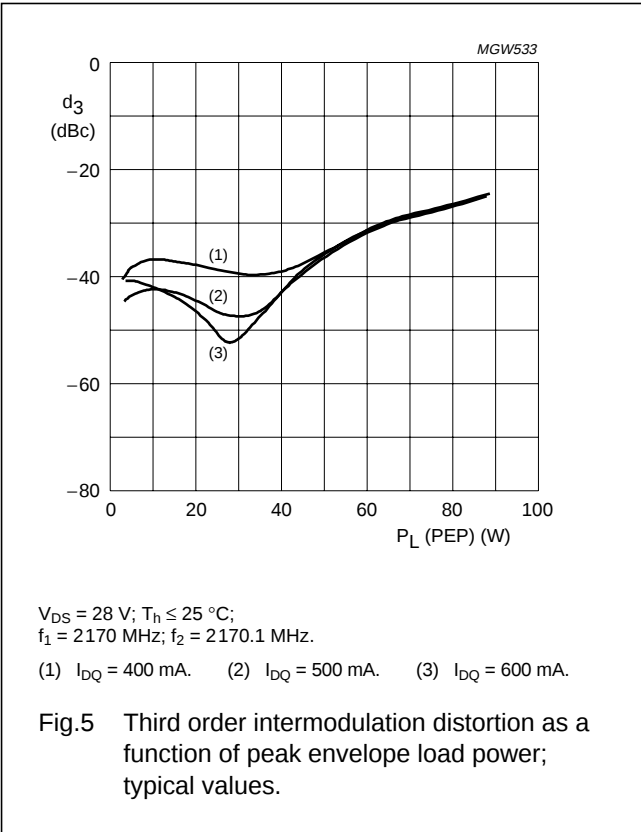
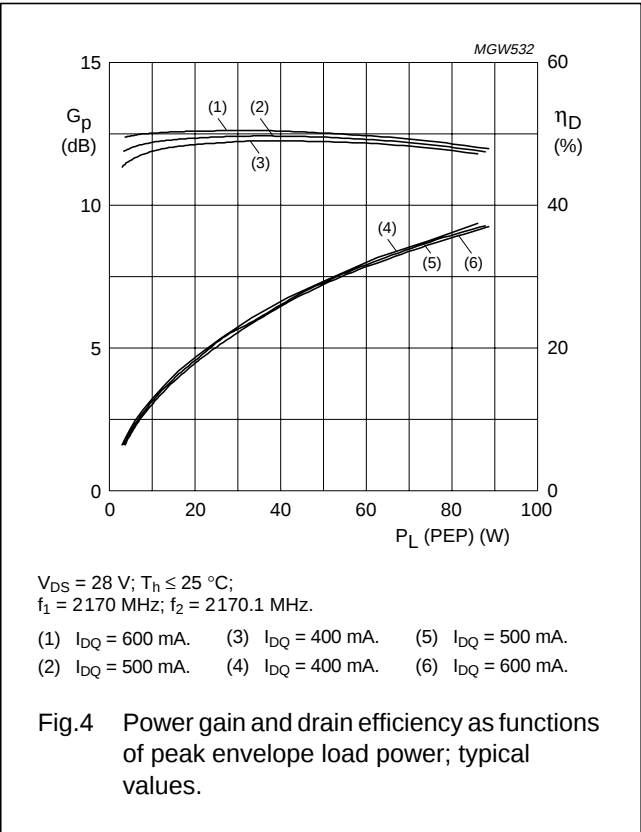
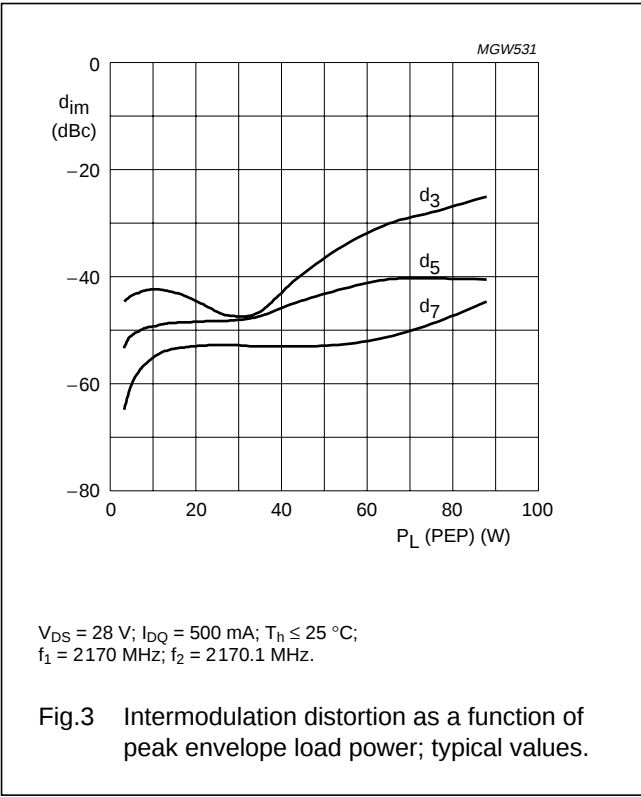
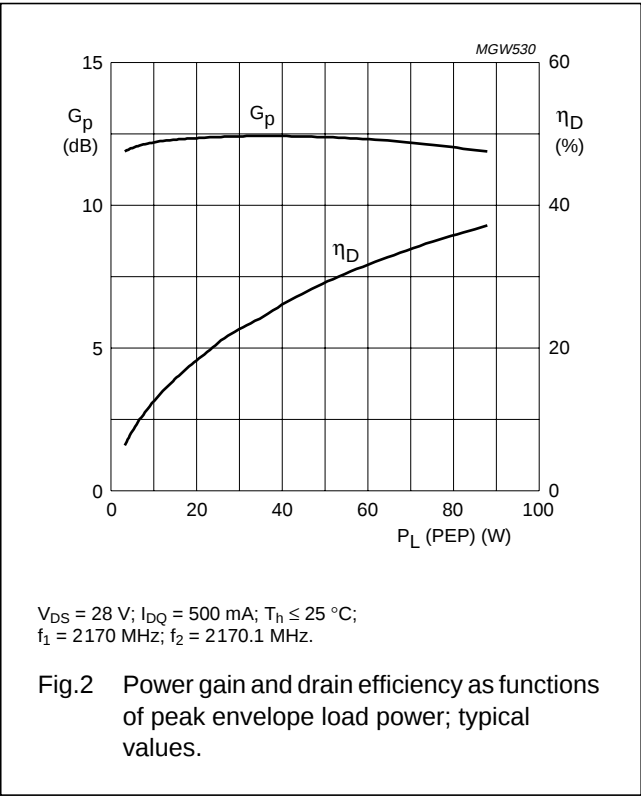
MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	d_{im} (dBc)
2-tone, class-AB	$f_1 = 2170$; $f_2 = 2170.1$	28	500	65 (PEP)	>11	>30	≤ -25

Ruggedness in class-AB operation

The BLF2022-70 is capable of withstanding a load mismatch corresponding to $VSWR = 10 : 1$ through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $I_{DQ} = 500\text{ mA}$; $P_L = 65\text{ W}$ (CW); $f = 2170\text{ MHz}$.

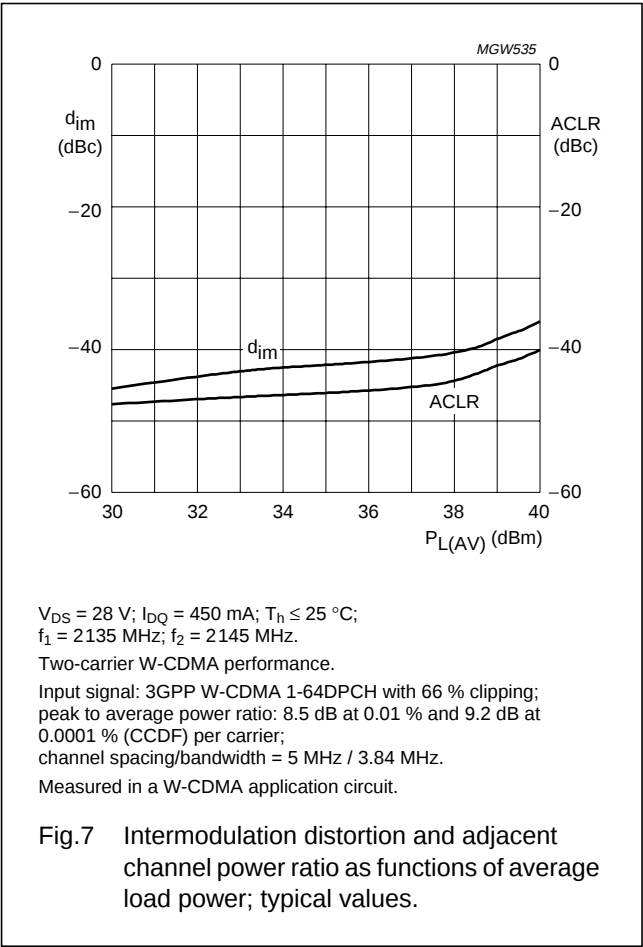
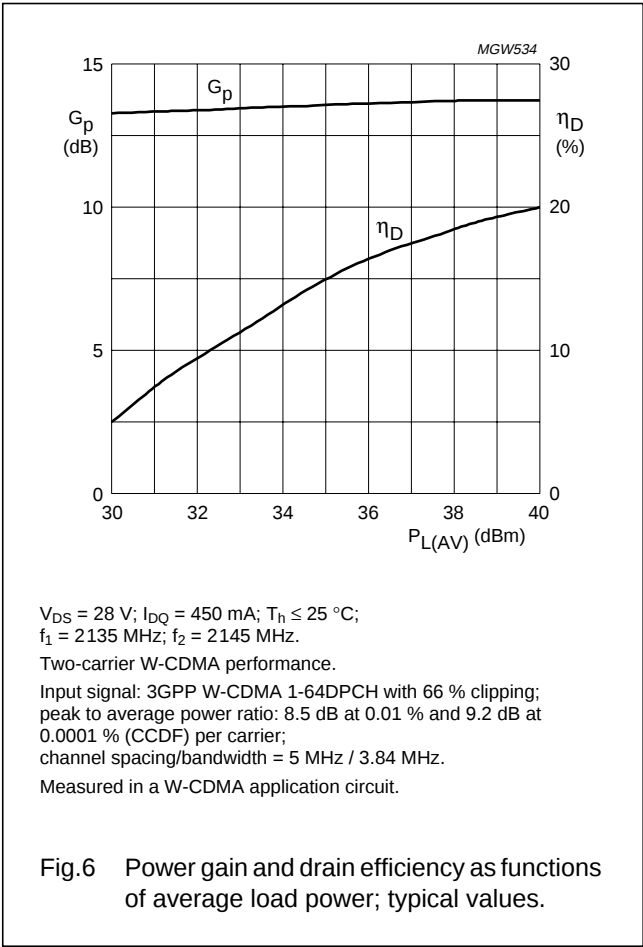
UHF power LDMOS transistor

BLF2022-70



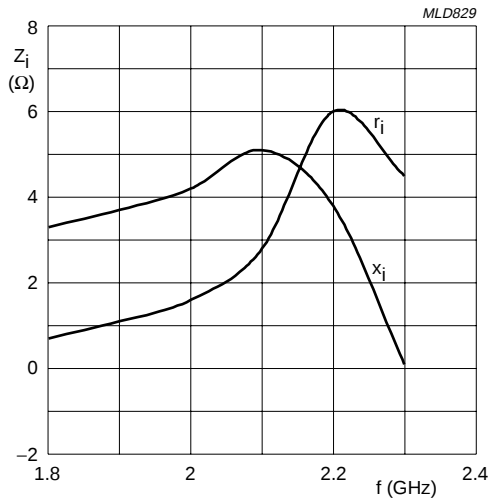
UHF power LDMOS transistor

BLF2022-70



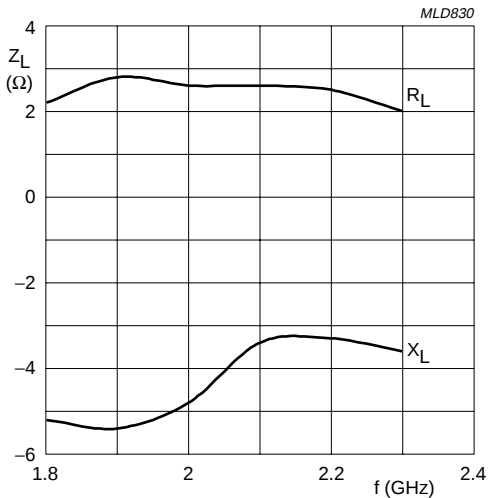
UHF power LDMOS transistor

BLF2022-70



$V_{DS} = 28\text{ V}$; $I_D = 500\text{ mA}$; $P_L = 65\text{ W}$; $T_h \leq 25\text{ }^{\circ}\text{C}$.

Fig.8 Input impedance as a function of frequency (series components); typical values.



$V_{DS} = 28\text{ V}$; $I_D = 500\text{ mA}$; $P_L = 65\text{ W}$; $T_h \leq 25\text{ }^{\circ}\text{C}$.

Fig.9 Load impedance as a function of frequency (series components); typical values.

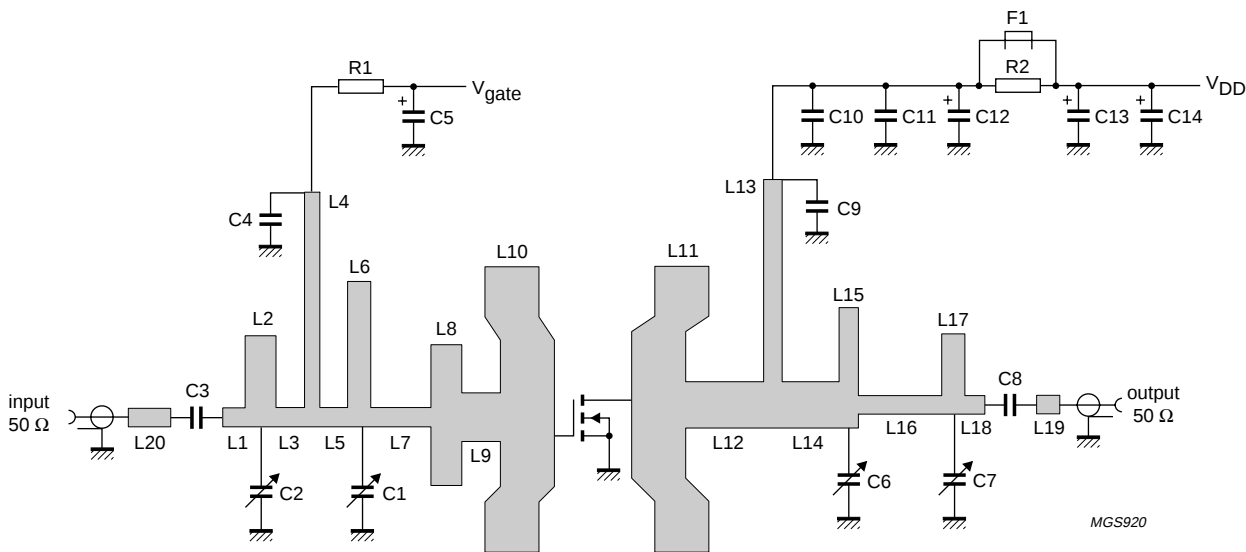


Fig.10 Class-AB test circuit at $f = 2.2\text{ GHz}$.

UHF power LDMOS transistor

BLF2022-70

List of components (See Figs 10 and 11)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C6, C7	Tekelec variable capacitor; type 37281	0.4 to 2.5 pF		
C3, C8	multilayer ceramic chip capacitor; note 1	12 pF		
C4, C9	multilayer ceramic chip capacitor; note 2	12 pF		
C5, C12	electrolytic capacitor	10 μ F; 100 V		2222 037 59109
C10	multilayer ceramic chip capacitor; note 1	1 nF		
C11	multilayer ceramic chip capacitor	100 nF		2222 581 16641
C13	tantalum SMD capacitor	4.5 μ F; 50 V		
C14	electrolytic capacitor	100 μ F; 63 V		2222 037 58101
F1	Ferroxcube chip-bead 8DS3/3/8/9-4S2			4330 030 36301
L1	stripline; note 3	50 Ω	2.9 $\times$ 2.4 mm	
L2	stripline; note 3	14.5 Ω	4 $\times$ 11.7 mm	
L3	stripline; note 3	50 Ω	3.7 $\times$ 2.4 mm	
L4	stripline; note 3	6 Ω	2 $\times$ 30.8 mm	
L5	stripline; note 3	50 Ω	3.6 $\times$ 2.4 mm	
L6	stripline; note 3	9.5 Ω	3 $\times$ 18.8 mm	
L7	stripline; note 3	50 Ω	7.8 $\times$ 2.4 mm	
L8	stripline; note 3	9.8 Ω	4 $\times$ 18.3 mm	
L9	stripline; note 3	24.4 Ω	5 $\times$ 6.3 mm	
L10, L11	stripline; note 3	5.1 Ω	7 $\times$ 37 mm	
L12	stripline; note 3	25.4 Ω	10.1 $\times$ 6 mm	
L13	stripline; note 3	5.7 Ω	2.4 $\times$ 32.8 mm	
L14	stripline; note 3	25.4 Ω	7.4 $\times$ 6 mm	
L15	stripline; note 3	11.3 Ω	2.5 $\times$ 15.6 mm	
L16	stripline; note 3	50 Ω	10.8 $\times$ 2.4 mm	
L17	stripline; note 3	16.1 Ω	3 $\times$ 10.4 mm	
L18	stripline; note 3	50 Ω	2.3 $\times$ 2.4 mm	
L19	stripline; note 3	50 Ω	3 $\times$ 2.4 mm	
L20	stripline; note 3	50 Ω	5.5 $\times$ 2.4 mm	
R1, R2	metal film resistor	10 Ω , 0.6 W		2322 156 11009

Notes

1. American Technical Ceramics type 100B or capacitor of same quality.
2. American Technical Ceramics type 100A or capacitor of same quality.
3. The striplines are on a double copper-clad printed-circuit board with Teflon dielectric ($\epsilon_r = 2.2$); thickness 0.79 mm.

UHF power LDMOS transistor

BLF2022-70

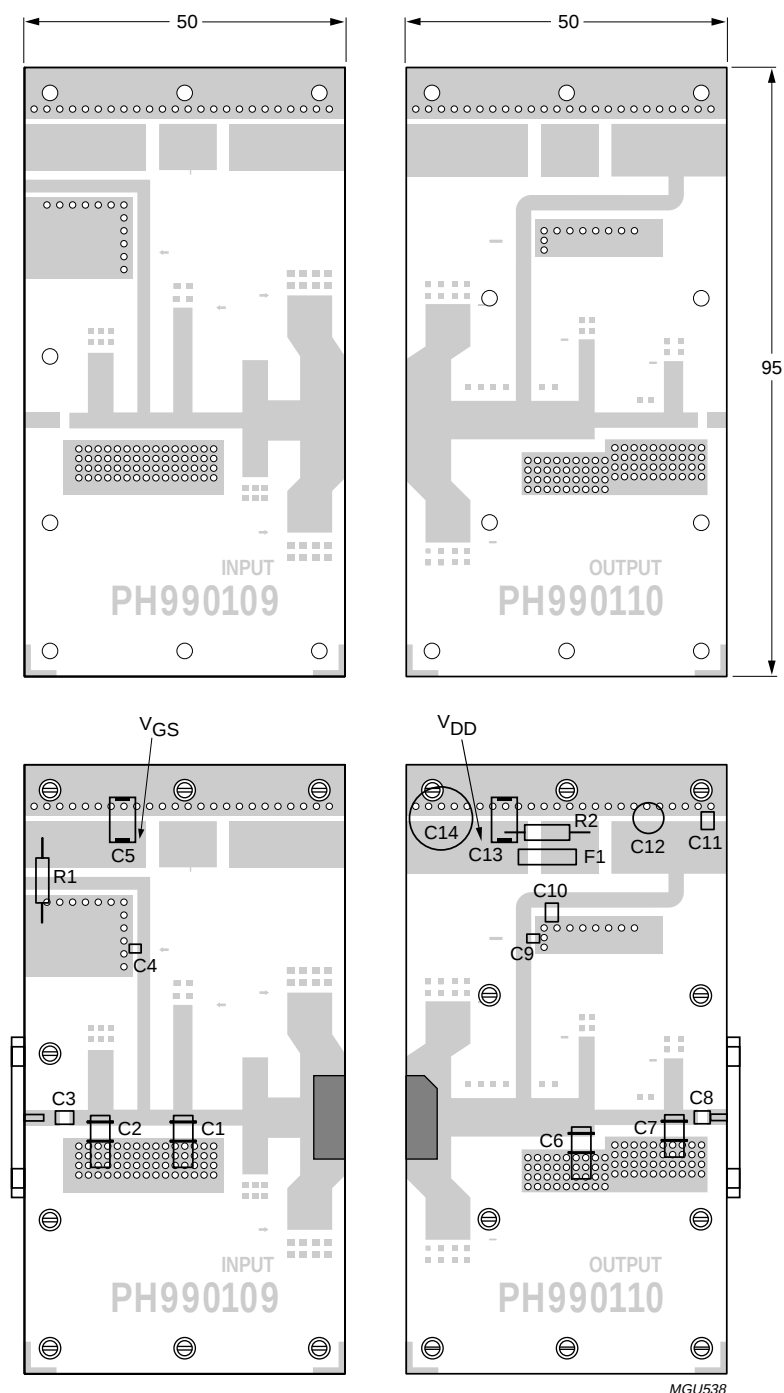


Fig.11 Component layout for 2.2 GHz class-AB test circuit.

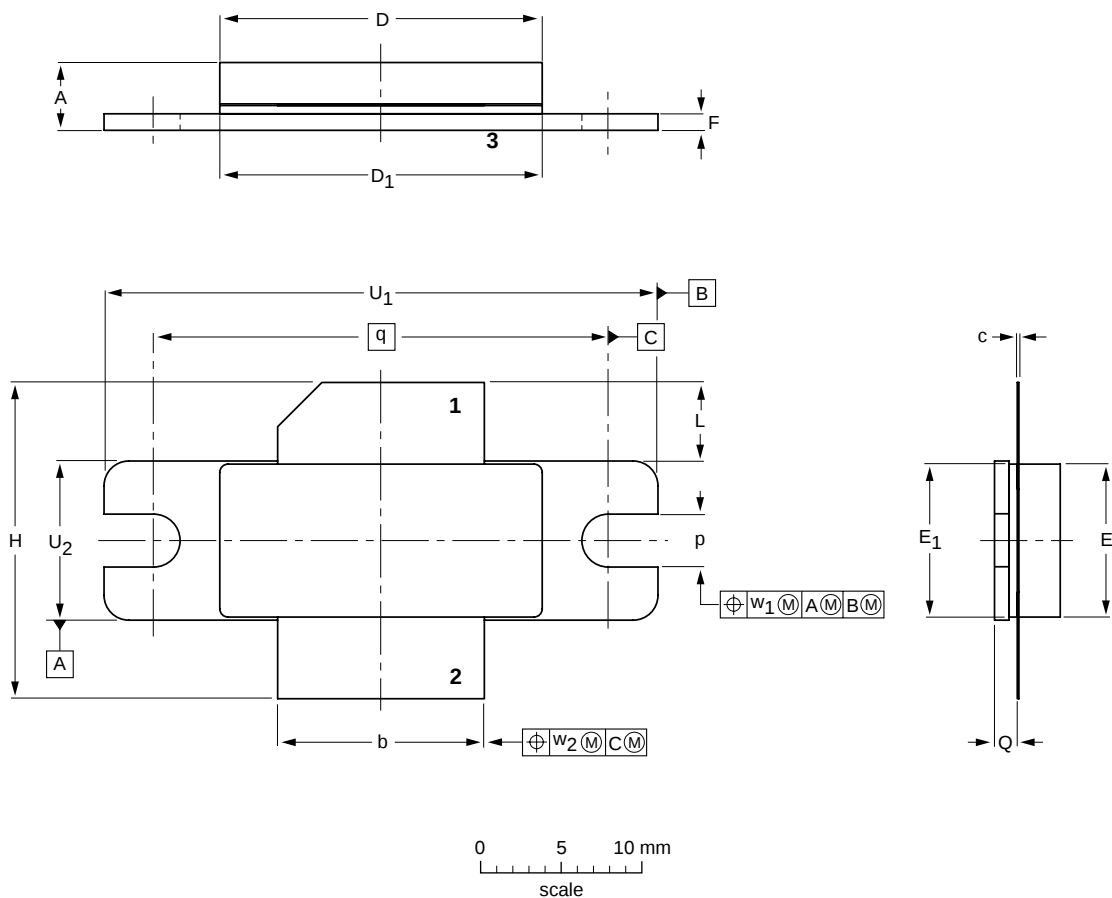
UHF power LDMOS transistor

BLF2022-70

PACKAGE OUTLINE

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D ₁	E	E ₁	F	H	L	p	Q	q	U ₁	U ₂	w ₁	w ₂
mm	4.72 3.99	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	3.38 3.12	1.70 1.45	27.94	34.16 33.91	9.91 9.65	0.25	0.51
inches	0.186 0.157	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.133 0.123	0.067 0.057	1.100	1.345 1.335	0.390 0.380	0.01	0.02

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT502A						99-10-13 99-12-28

UHF power LDMOS transistor

BLF2022-70

DATA SHEET STATUS

DATA SHEET STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	DEFINITIONS
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A.

Notes

1. Please consult the most recently issued data sheet before initiating or completing a design.
2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

DEFINITIONS

Short-form specification — The data in a short-form 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 definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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 — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

DISCLAIMERS

Life support applications — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no licence or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

UHF power LDMOS transistor

BLF2022-70

NOTES

Philips Semiconductors – a worldwide company

Contact information

For additional information please visit <http://www.semiconductors.philips.com>. Fax: **+31 40 27 24825**

For sales offices addresses send e-mail to: sales.addresses@www.semiconductors.philips.com.

© Koninklijke Philips Electronics N.V. 2002

SCA74

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

613524/03/pp12

Date of release: 2002 May 17

Document order number: 9397 750 09624

Let's make things better.

**Philips
Semiconductors**



PHILIPS