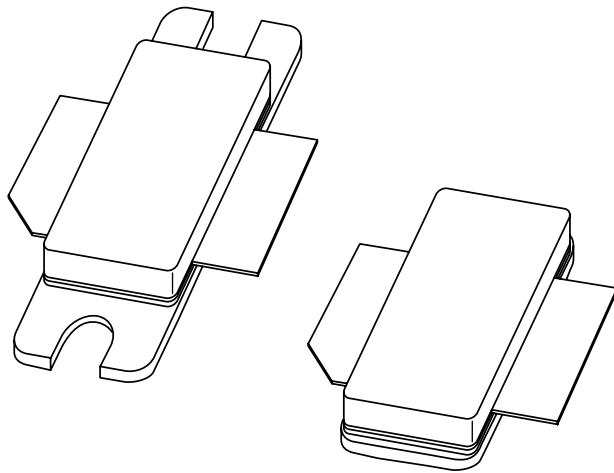


DATA SHEET



BLF2022-90; BLF2022S-90 UHF power LDMOS transistors

Product specification
Supersedes data of 2003 June 13

2003 Sep 30

UHF power LDMOS transistors

BLF2022-90; BLF2022S-90

FEATURES

- Typical single carrier W-CDMA performance at a supply voltage of 28 V and an I_{DQ} of 750 mA:
 - Output power = 15 W (AV)
 - Gain = 13.0 dB
 - Efficiency = 20%
 - $ACLR_5 = -40$ dBc
- Easy power control
- Excellent ruggedness
- High power gain
- Excellent thermal stability
- Designed for broadband operation (2000 to 2200 MHz)
- Internally matched for ease of use.

APPLICATIONS

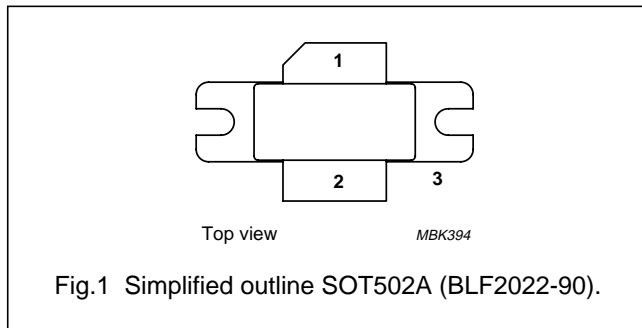
- RF power amplifiers for W-CDMA base stations and multicarrier applications in the 2000 to 2200 MHz frequency range.

DESCRIPTION

90 W LDMOS power transistor for base station applications at frequencies from 2000 to 2200 MHz.

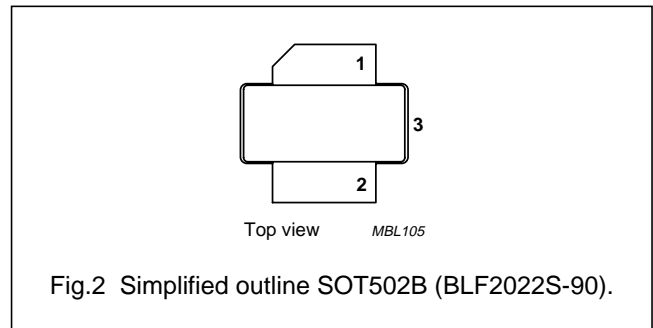
PINNING - SOT502A

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



PINNING - SOT502B

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



QUICK REFERENCE DATA

Typical RF performance at $T_h = 25$ °C in a common source class-AB test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)	d_{im} (dBc)	$ACLR_5$ (dBc)
2-tone, class-AB	$f_1 = 2170; f_2 = 2170.1$	28	750	90 (PEP)	12.2	35	-28	-
Single carrier W-CDMA	2140	28	750	15 (AV)	13.0	20	-	-40

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 transistors

BLF2022-90; BLF2022S-90

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	–	12	A
T_{stg}	storage temperature	–65	+150	°C
T_j	junction temperature	–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-c}$	thermal resistance from junction to case	$T_h = 25\text{ °C}$; note 1	0.65	K/W
$R_{th\ c-h}$	thermal resistance from case to heatsink	$T_h = 25\text{ °C}$; note 2	0.2	K/W

Notes

1. Thermal resistance is determined under specified RF operating conditions.
2. Depending on mounting conditions.

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0$; $I_D = 2.1\text{ mA}$	65	–	–	V
V_{GSth}	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 210\text{ mA}$	4.4	–	5.5	V
I_{DSS}	drain-source leakage current	$V_{GS} = 0$; $V_{DS} = 26\text{ V}$	–	–	15	μA
I_{DSX}	on-state drain current	$V_{GS} = V_{GSth} + 9\text{ V}$; $V_{DS} = 10\text{ V}$	27	–	–	A
I_{GSS}	gate leakage current	$V_{GS} = \pm 15\text{ V}$; $V_{DS} = 0$	–	–	38	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}$; $I_D = 7.5\text{ A}$	–	6.2	–	S
R_{DSon}	drain-source on-state resistance	$V_{GS} = V_{GSth} + 9\text{ V}$; $I_D = 7.5\text{ A}$	–	0.1	–	Ω
C_{rs}	feedback capacitance	$V_{GS} = 0$; $V_{DS} = 26\text{ V}$; $f = 1\text{ MHz}$	–	5.1	–	pF

APPLICATION INFORMATION

RF performance in a common source class-AB circuit. $T_h = 25\text{ °C}$; $R_{th\ j-c} = 0.65\text{ K/W}$; 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	750	90 (PEP)	>11.5 (note 1)	>30	≤–25

Note

1. See RF gain grouping table.

UHF power LDMOS transistors

BLF2022-90; BLF2022S-90

RF Gain grouping

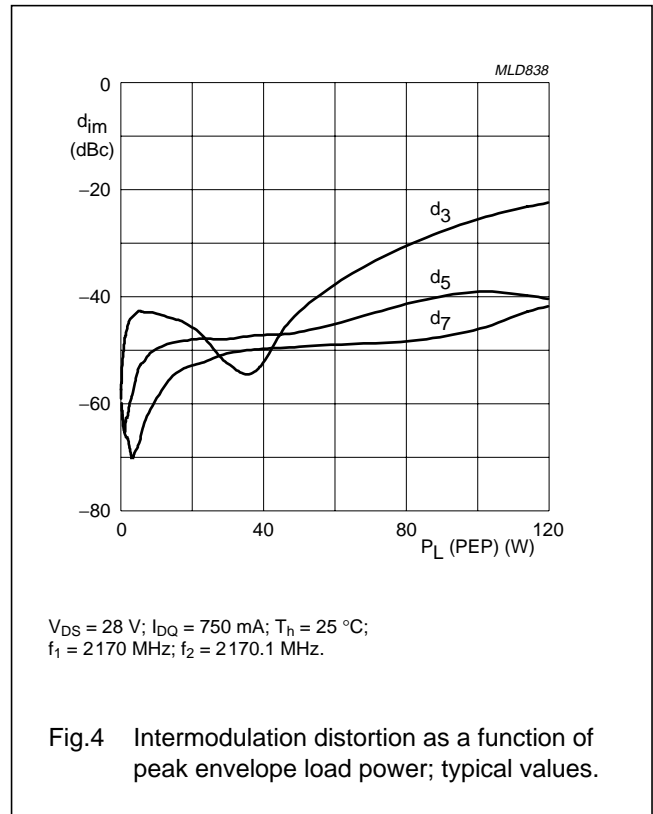
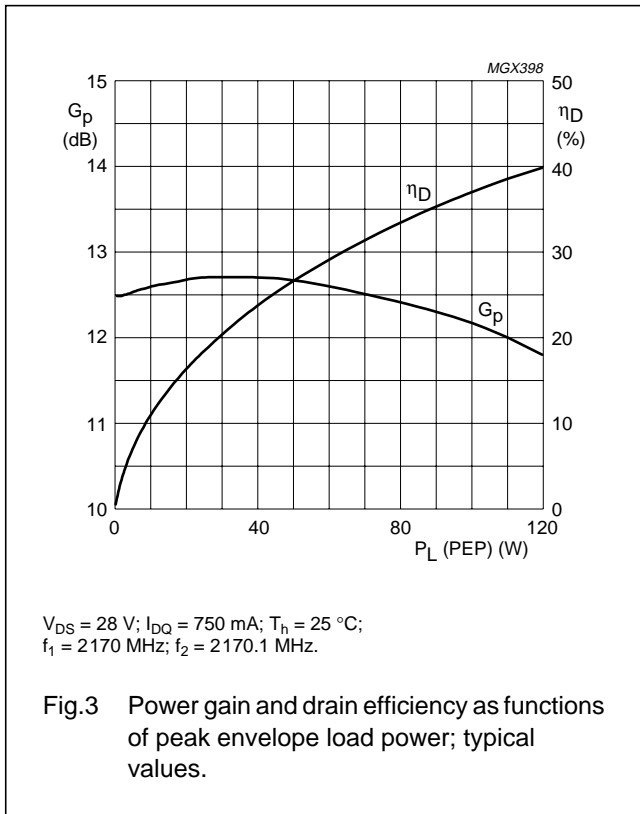
CODE ⁽¹⁾	GAIN ⁽²⁾ (dB)	
	MIN.	MAX.
B	11.5	12.0
C	12.0	12.5
D	12.5	13.0
E	13.0	13.5

Note

- 0.2 dB overlap is allowed for measurement repeatability.
- For 2-tone at $f_1 = 2170$ MHz; $f_2 = 2170.1$ MHz.

Ruggedness in class-AB operation

The BLF2022-90/BLF2022S-90 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 28$ V; $I_{DQ} = 750$ mA; $P_L = 90$ W (CW); $f = 2170$ MHz.



UHF power LDMOS transistors

BLF2022-90; BLF2022S-90

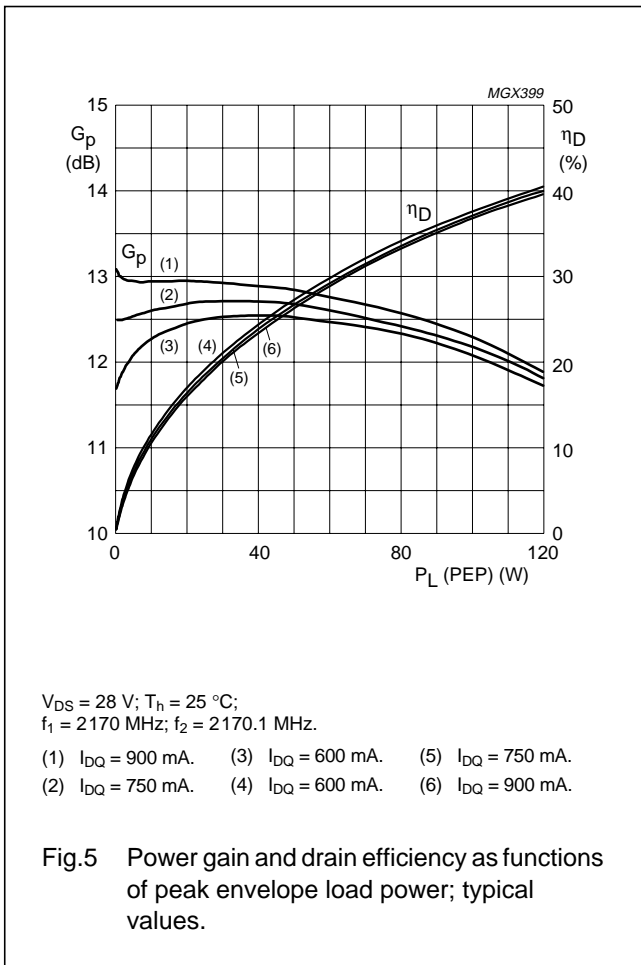


Fig.5 Power gain and drain efficiency as functions of peak envelope load power; typical values.

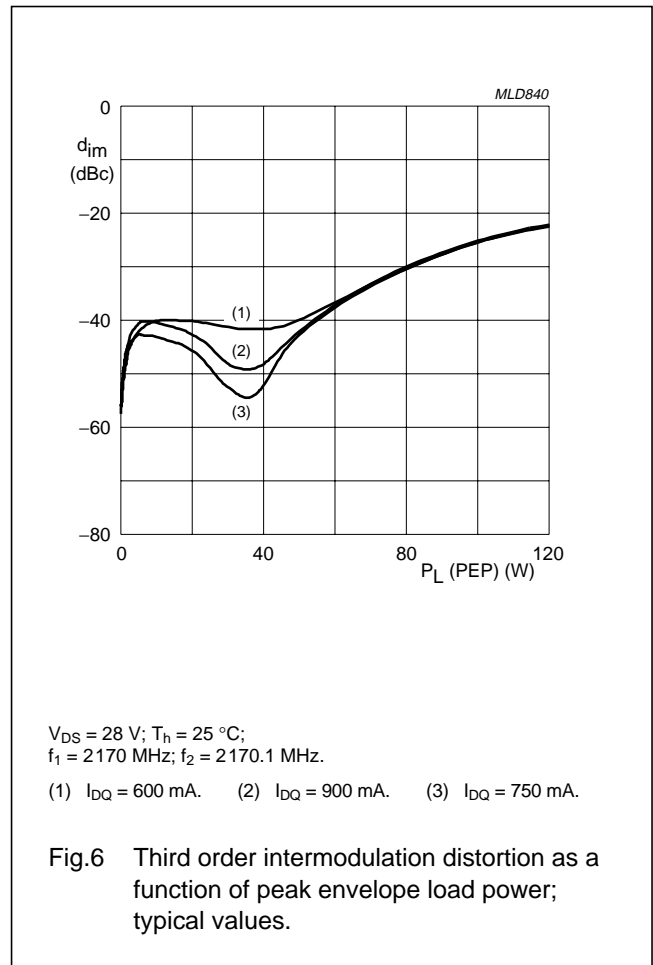
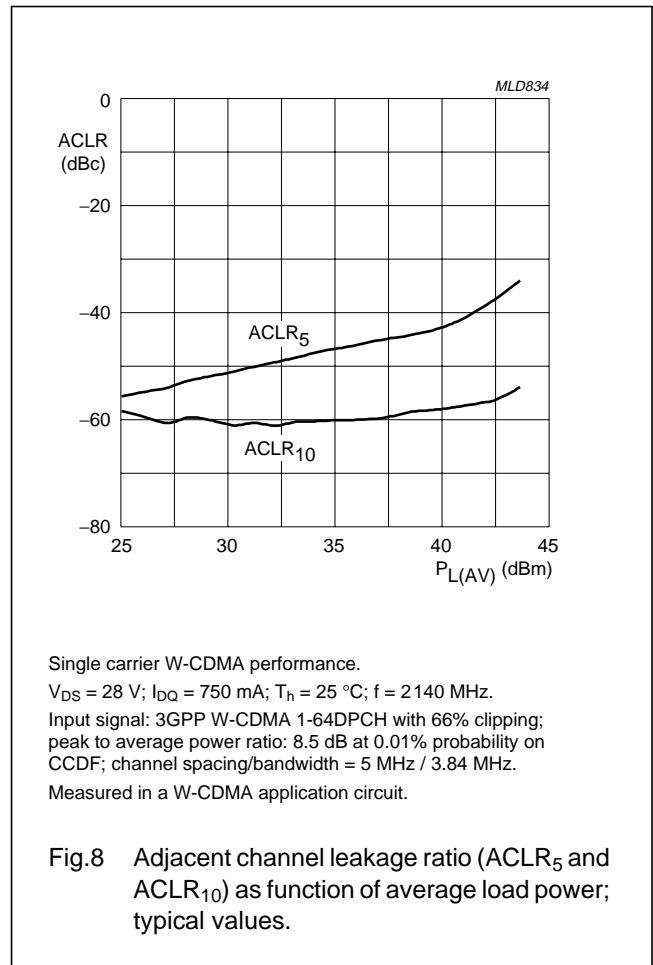
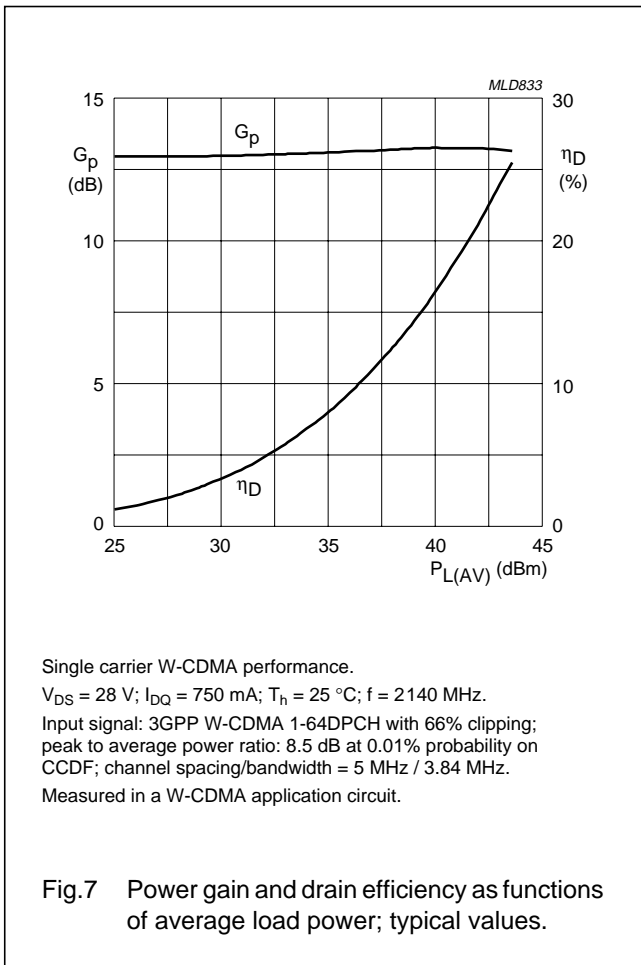


Fig.6 Third order intermodulation distortion as a function of peak envelope load power; typical values.

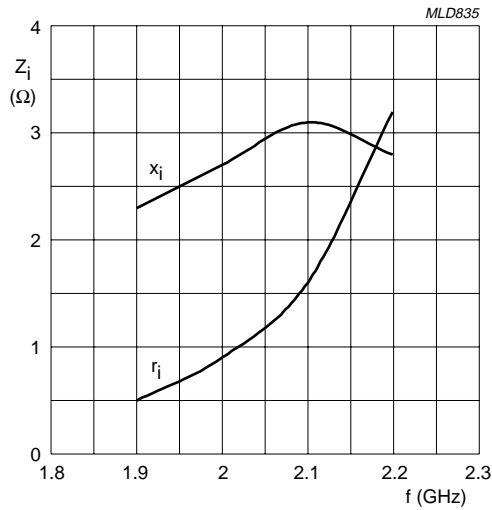
UHF power LDMOS transistors

BLF2022-90; BLF2022S-90



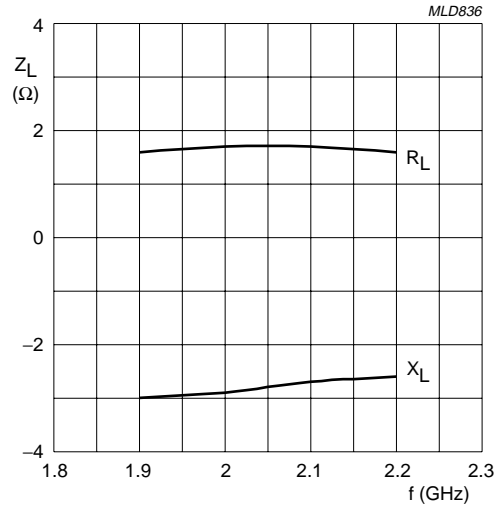
UHF power LDMOS transistors

BLF2022-90; BLF2022S-90



$V_{DS} = 28\text{ V}$; $I_D = 750\text{ mA}$; $P_L = 90\text{ W}$; $T_h = 25\text{ }^\circ\text{C}$.

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



$V_{DS} = 28\text{ V}$; $I_D = 750\text{ mA}$; $P_L = 90\text{ W}$; $T_h = 25\text{ }^\circ\text{C}$.

Fig.10 Load impedance as a function of frequency (series components); typical values.

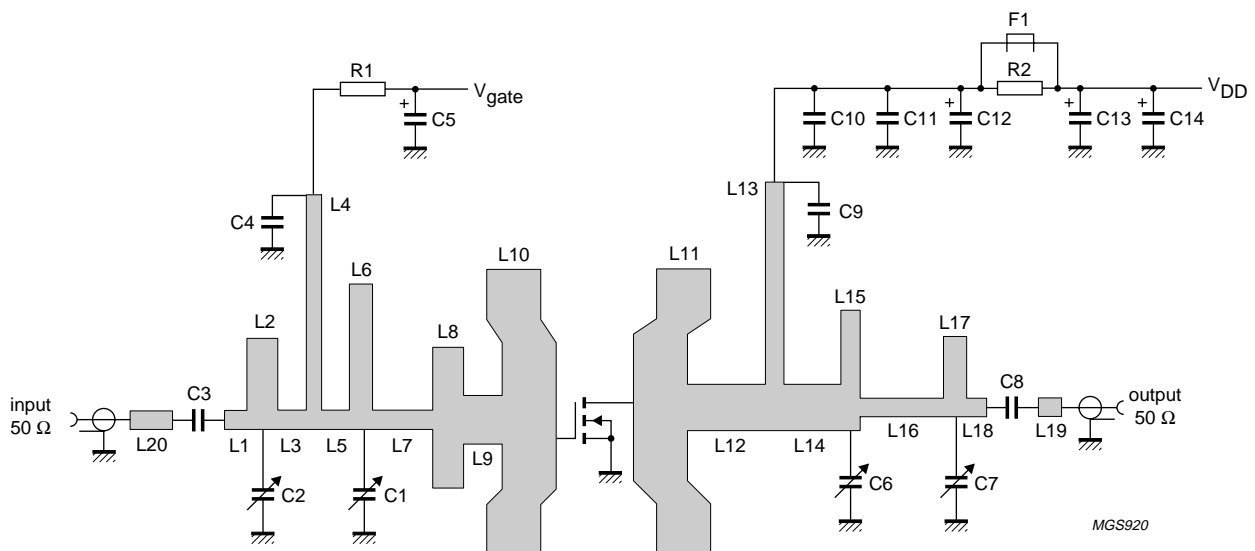


Fig.11 Class-AB test circuit at $f = 2.2\text{ GHz}$.

UHF power LDMOS transistors

BLF2022-90; BLF2022S-90

List of components; see Figs 11 and 12.

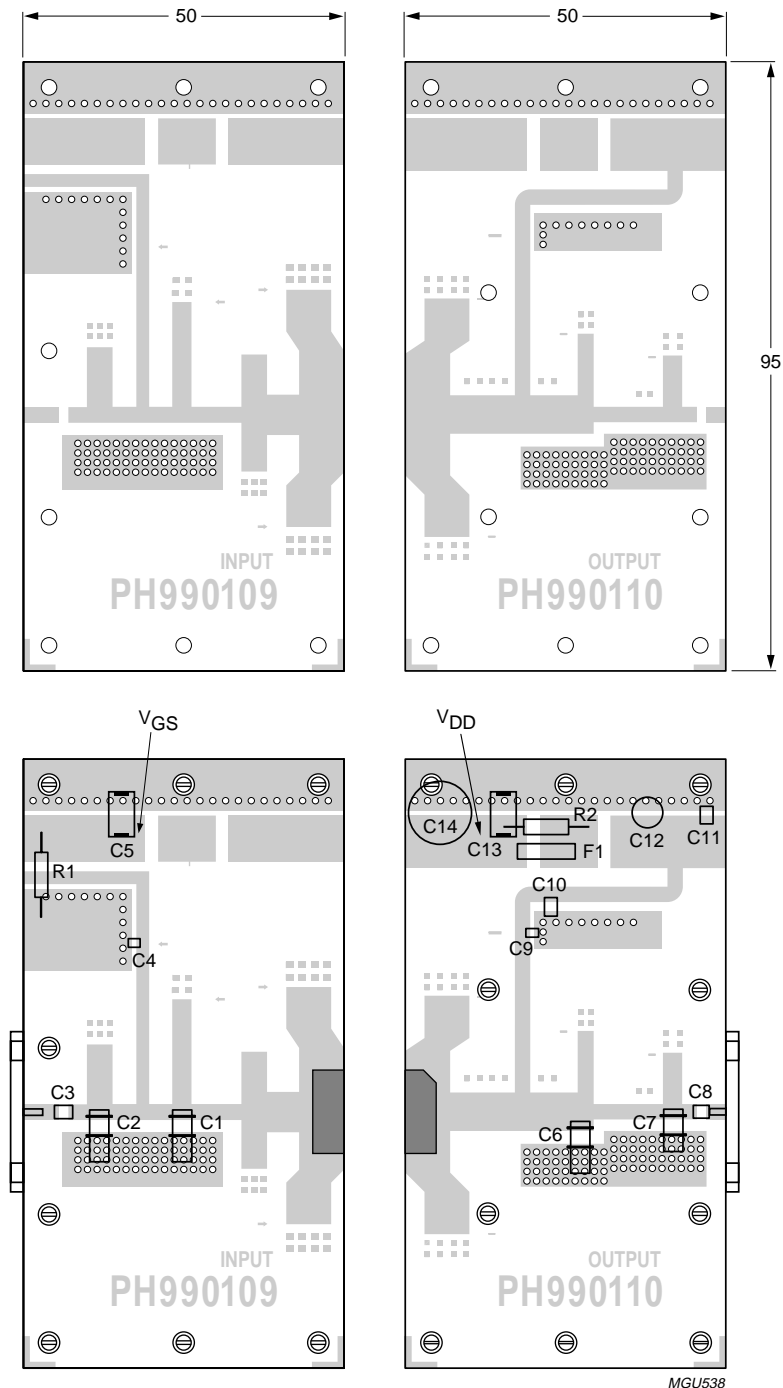
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2, C6, C7	Tekelec variable capacitor; type 37281	0.4 to 2.5 pF		
C3, C8	multilayer ceramic chip capacitor; note 1	12 pF		
C4, C9	multilayer ceramic chip capacitor; note 2	12 pF		
C5, C12	electrolytic capacitor	10 μ F; 100 V		2222 037 59109
C10	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 transistors

BLF2022-90; BLF2022S-90



MGU538

Dimensions in mm.

The components are situated on one side of the copper-clad printed-circuit board with Teflon dielectric ($\epsilon_r = 2.2$), thickness 0.79 mm. The other side is unetched and serves as a ground plane.

Fig.12 Component layout for 2.2 GHz class-AB test circuit.

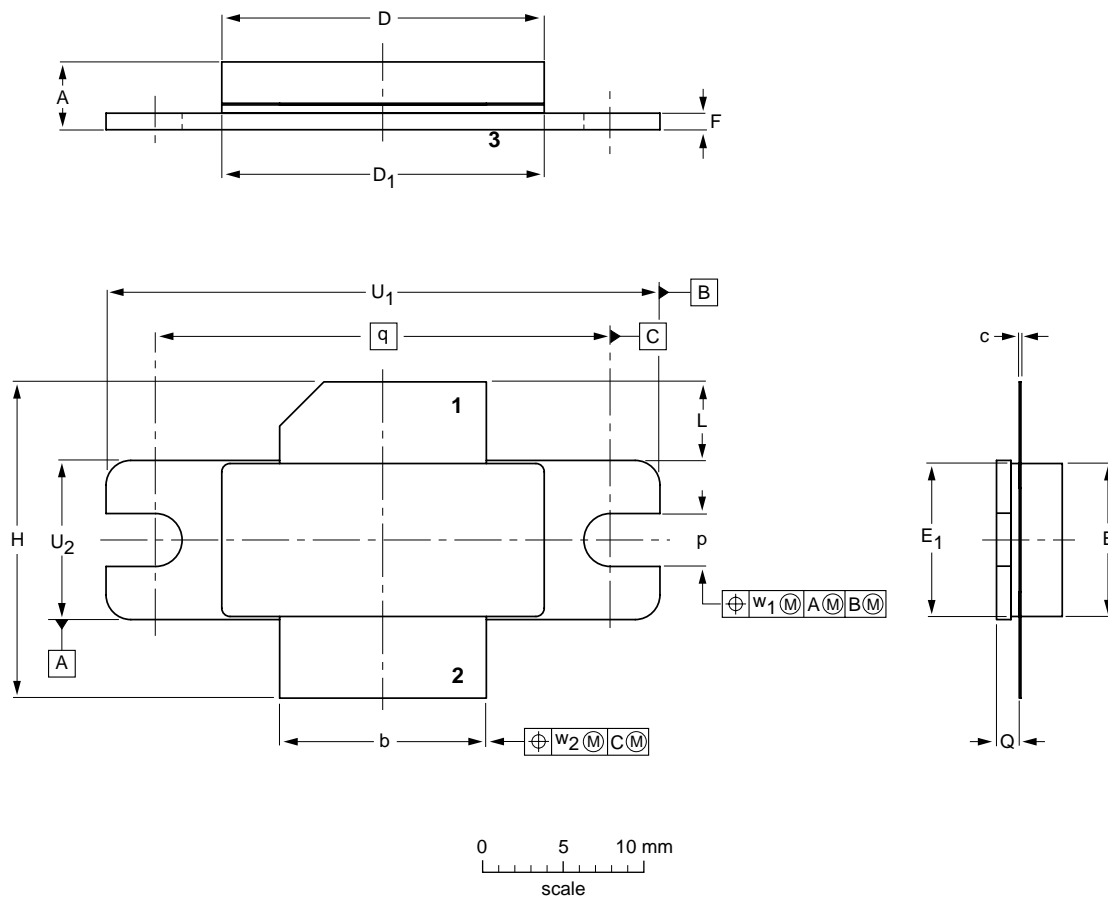
UHF power LDMOS transistors

BLF2022-90; BLF2022S-90

PACKAGE OUTLINES

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 3.43	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 0.135	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

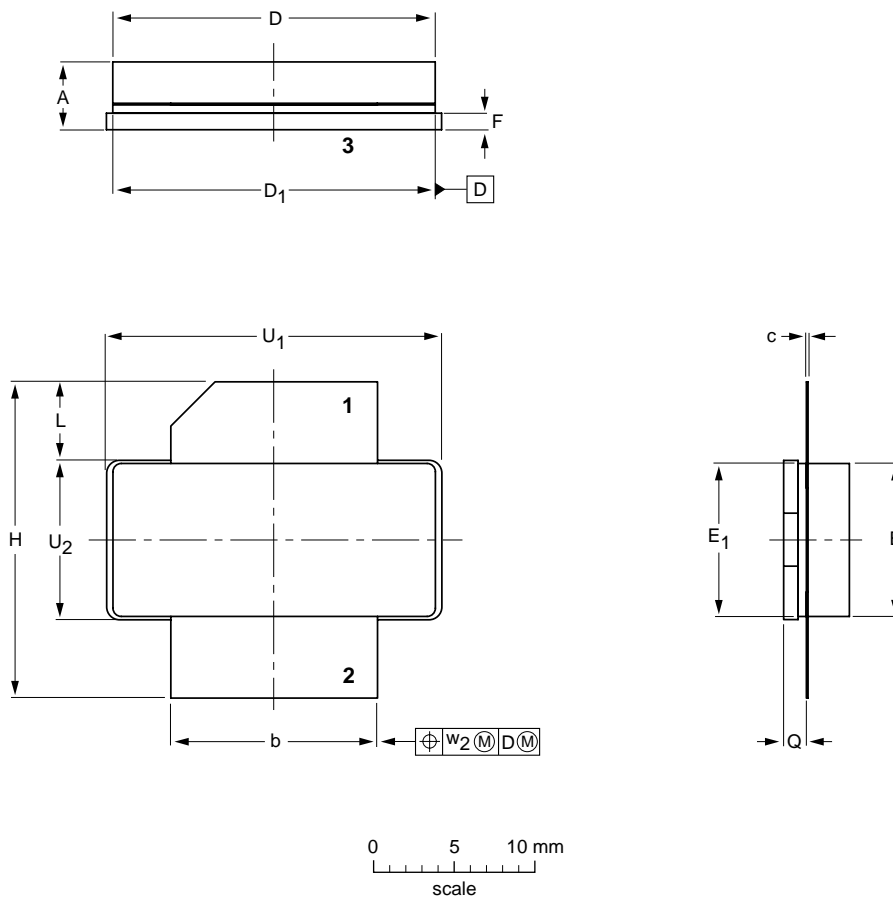
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502A						-99-12-28- 03-01-10

UHF power LDMOS transistors

BLF2022-90; BLF2022S-90

Earless flanged LDMOST ceramic package; 2 leads

SOT502B



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

UNIT	A	b	c	D	D ₁	E	E ₁	F	H	L	Q	U ₁	U ₂	w ₂
mm	4.72 3.43	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	1.70 1.45	20.70 20.45	9.91 9.65	0.25
inches	0.186 0.135	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	0.067 0.057	0.815 0.805	0.390 0.380	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502B						99-12-28- 03-01-10

UHF power LDMOS transistors

BLF2022-90; BLF2022S-90

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾⁽³⁾	DEFINITION
I	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.
II	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.
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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.

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