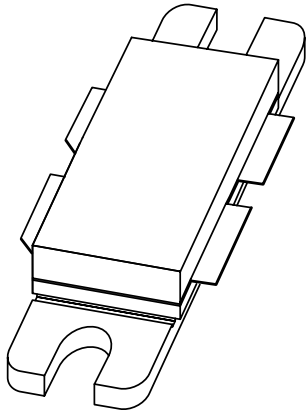


# DATA SHEET



## **BLF861** UHF power LDMOS transistor

Preliminary specification

1999 Aug 26

# UHF power LDMOS transistor

# BLF861

### FEATURES

- High power gain
- Easy power control
- Excellent ruggedness
- Source on underside eliminates DC isolators, reducing common mode inductance
- Designed for broadband operation (UHF band).

### APPLICATIONS

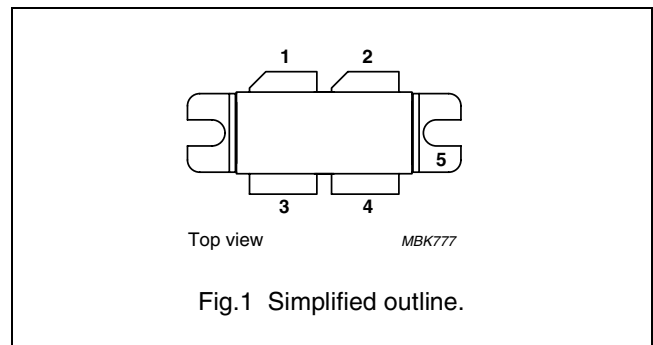
- Communication transmitter applications in the UHF frequency range.

### DESCRIPTION

Silicon N-channel enhancement mode lateral D-MOS push-pull transistor in an SOT540A package with ceramic cap. The common source is connected to the mounting flange.

### PINNING - SOT540A

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



### QUICK REFERENCE DATA

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

MODE OF OPERATION	f (MHz)	V <sub>DS</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	η <sub>D</sub> (%)	ΔG <sub>p</sub> (dB)
CW, class-AB	860	32	150	>14	>50	≤1
PAL BG (TV), class-AB	860 (ch 69)	32	typ.170 (peak sync)	>14	>40	note 1

### Notes

1. Sync compression: input sync: ≥33%; output sync: 27 %

### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>DS</sub>	drain-source voltage		–	65	V
V <sub>GS</sub>	gate-source voltage		–	±15	V
I <sub>D</sub>	drain current (DC)		–	18	A
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> ≤ 25 °C	–	318	W
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	junction temperature		–	200	°C

### 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.

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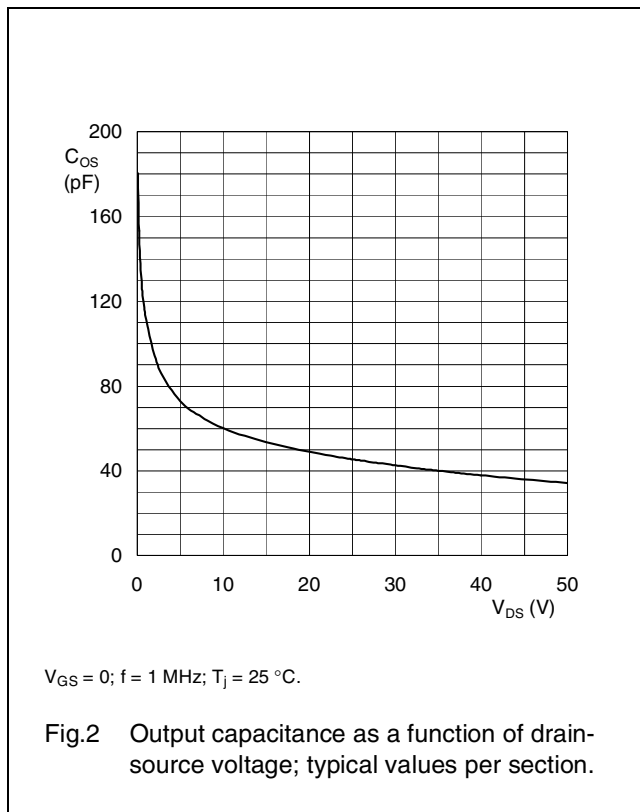
**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting base	$T_{mb} = 25\text{ °C}; P_{tot} = 318\text{ W}$	0.55	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink		0.2	K/W

**CHARACTERISTICS**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0; I_D = 1.5\text{ mA}$	65	–	–	V
$V_{GSth}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 150\text{ mA}$	4	–	5	V
$I_{DSS}$	drain-source leakage current	$V_{GS} = 0; V_{DS} = 32\text{ V}$	–	–	10	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GSth} + 9\text{ V}; V_{DS} = 10\text{ V}$	18	–	–	A
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 15\text{ V}; V_{DS} = 0$	–	–	100	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 4\text{ A}$	–	4	–	S
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = V_{GSth} + 9\text{ V}; I_D = 4\text{ A}$	–	160	–	$\text{m}\Omega$
$C_{is}$	input capacitance	$V_{GS} = 0; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	–	84	–	pF
$C_{os}$	output capacitance	$V_{GS} = 0; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	–	42	–	pF
$C_{rs}$	feedback capacitance	$V_{GS} = 0; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	–	6	–	pF



# UHF power LDMOS transistor

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## APPLICATION INFORMATION

RF performance in a common source class-AB circuit.  $T_h = 25\text{ }^\circ\text{C}$ ;  $R_{th\ mb-h} = 0.15\text{ K/W}$ , unless otherwise specified.

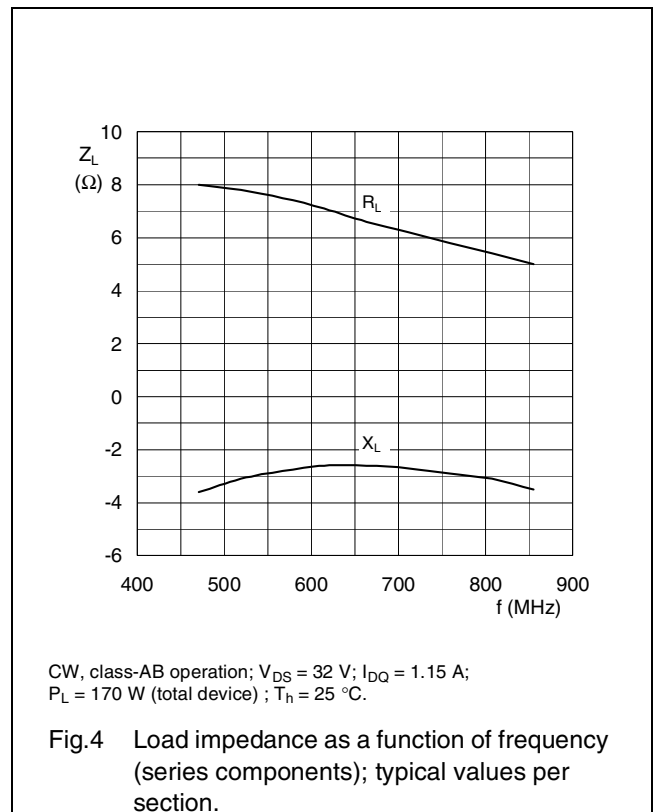
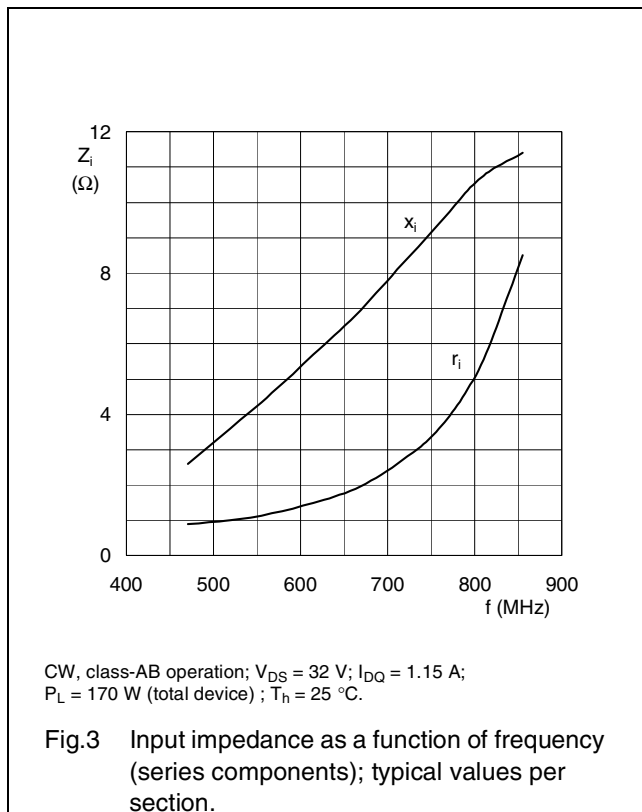
MODE OF OPERATION	f (MHz)	V <sub>DS</sub> (V)	I <sub>DQ</sub> (A)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	η <sub>D</sub> (%)	d <sub>IM</sub> (dBc)	ΔG <sub>p</sub> (dB)
CW, class-AB	860	32	1.15	150	>14	>50	–	≤1
2-tone, class-AB	f <sub>1</sub> = 860 f <sub>1</sub> = 860.1	32	1.15	150 (PEP)	>14	>40	≤–30	–
PAL BG (TV), class-AB	860 (ch 69)	32	1.15	typ.170 (peak sync)	>14	>40	–	note 1

### Notes

1. Sync compression: input sync: ≥33%; output sync: 27 % measured in narrowband testcircuit.

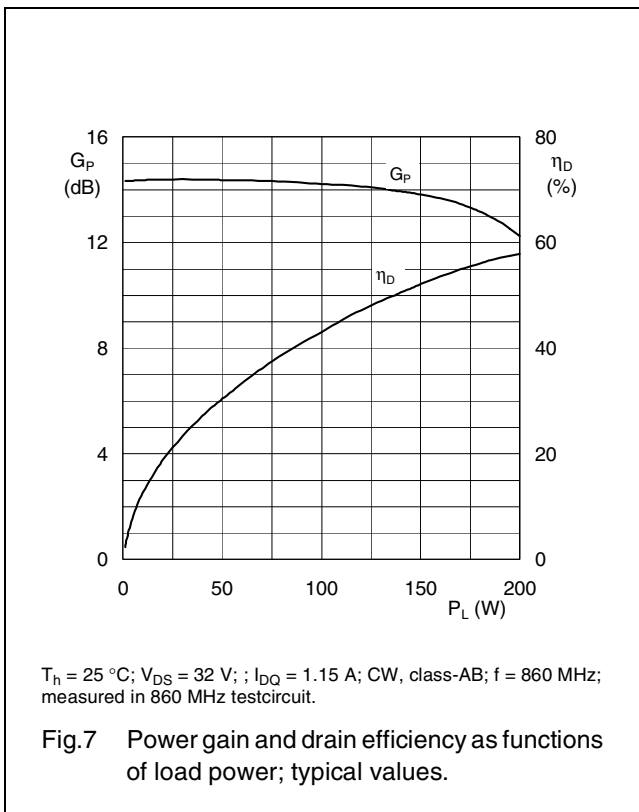
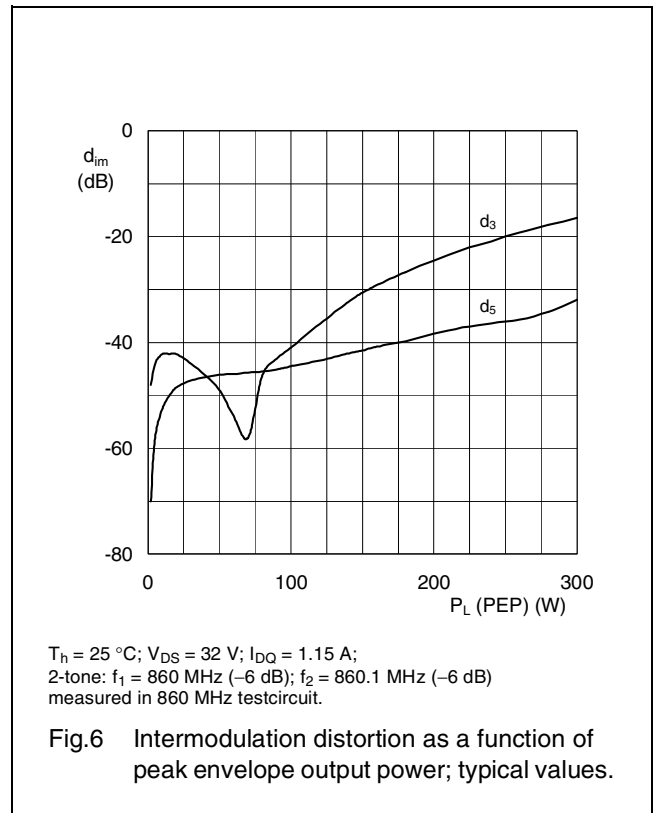
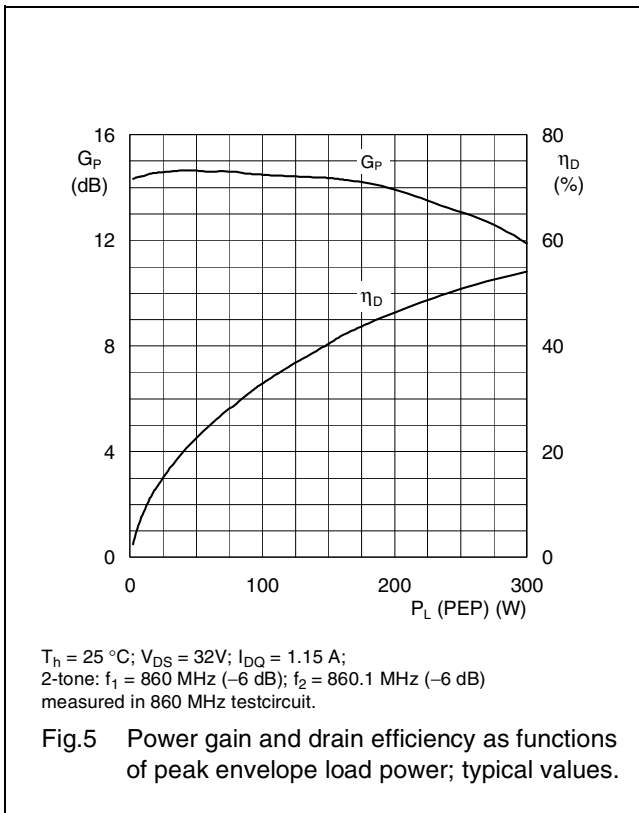
### Ruggedness in class-AB operation

The BLF861 is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V<sub>DS</sub> = 32 V; f = 860 MHz at rated load power.



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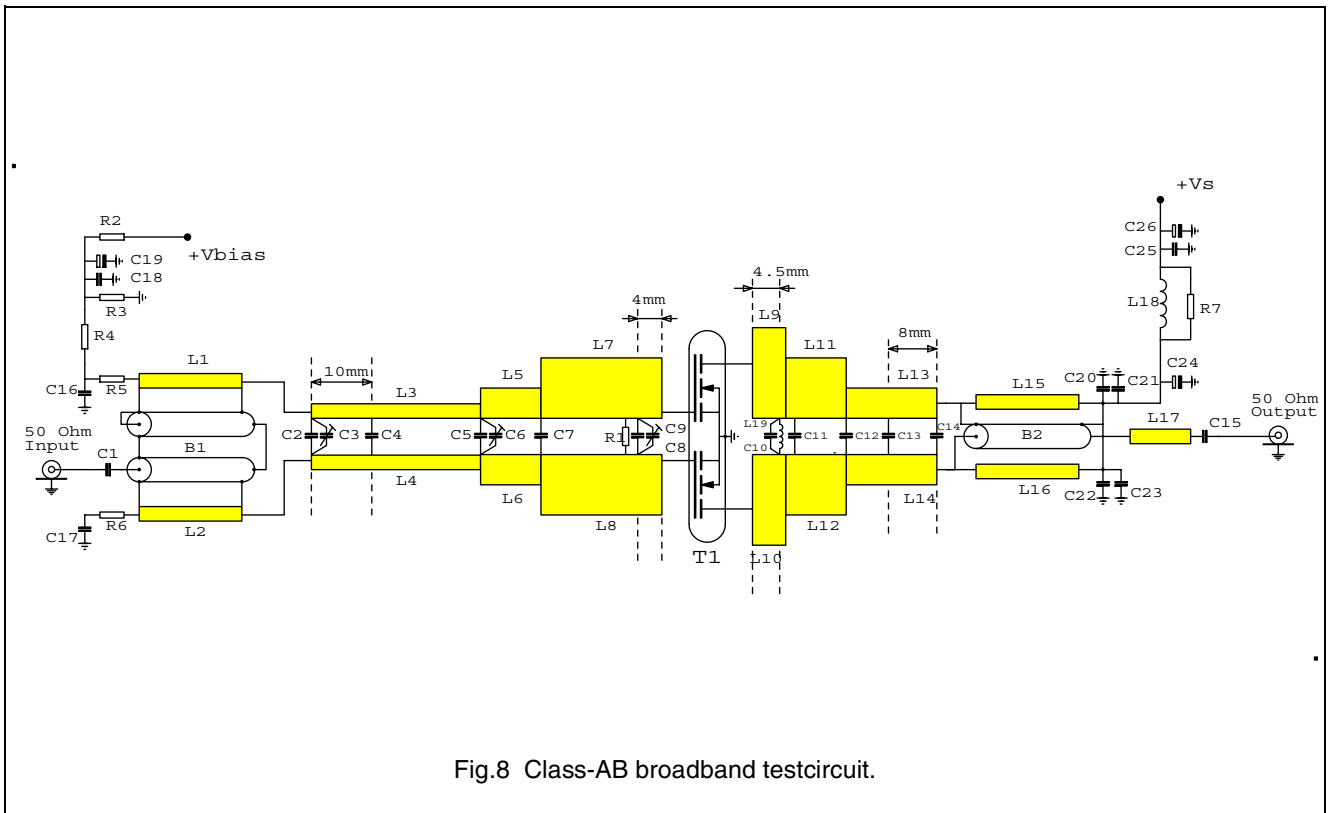


Fig.8 Class-AB broadband testcircuit.

List of components

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1	multilayer ceramic chip capacitor; note 1	20 pF		
C2	multilayer ceramic chip capacitor; note 1	4.3 pF		
C3, C6, C9	Tekelec trimmer	0.6 to 4.5 pF		
C4	multilayer ceramic chip capacitor; note 1	8.2 pF		
C5	multilayer ceramic chip capacitor; note 1	10 pF		
C7	multilayer ceramic chip capacitor; note 1	6.8 pF		
C8	multilayer ceramic chip capacitor; note 1	13 pF		
C10, C11	multilayer ceramic chip capacitor; note 2	8.2 pF		
C12	multilayer ceramic chip capacitor; note 2	3.3 pF		
C13	multilayer ceramic chip capacitor; note 2	6.8 pF		
C14	multilayer ceramic chip capacitor; note 2	1 pF		
C15	multilayer ceramic chip capacitor; note 2	30 pF		
C16, C17	multilayer ceramic chip capacitor	1 nF		
C18, C25	multilayer ceramic chip capacitor	100 nF		
C19, C26	multilayer ceramic chip capacitor	100 μF		
C20, C21, C22, C23	multilayer ceramic chip capacitor; note 3	100 pF		

## UHF power LDMOS transistor

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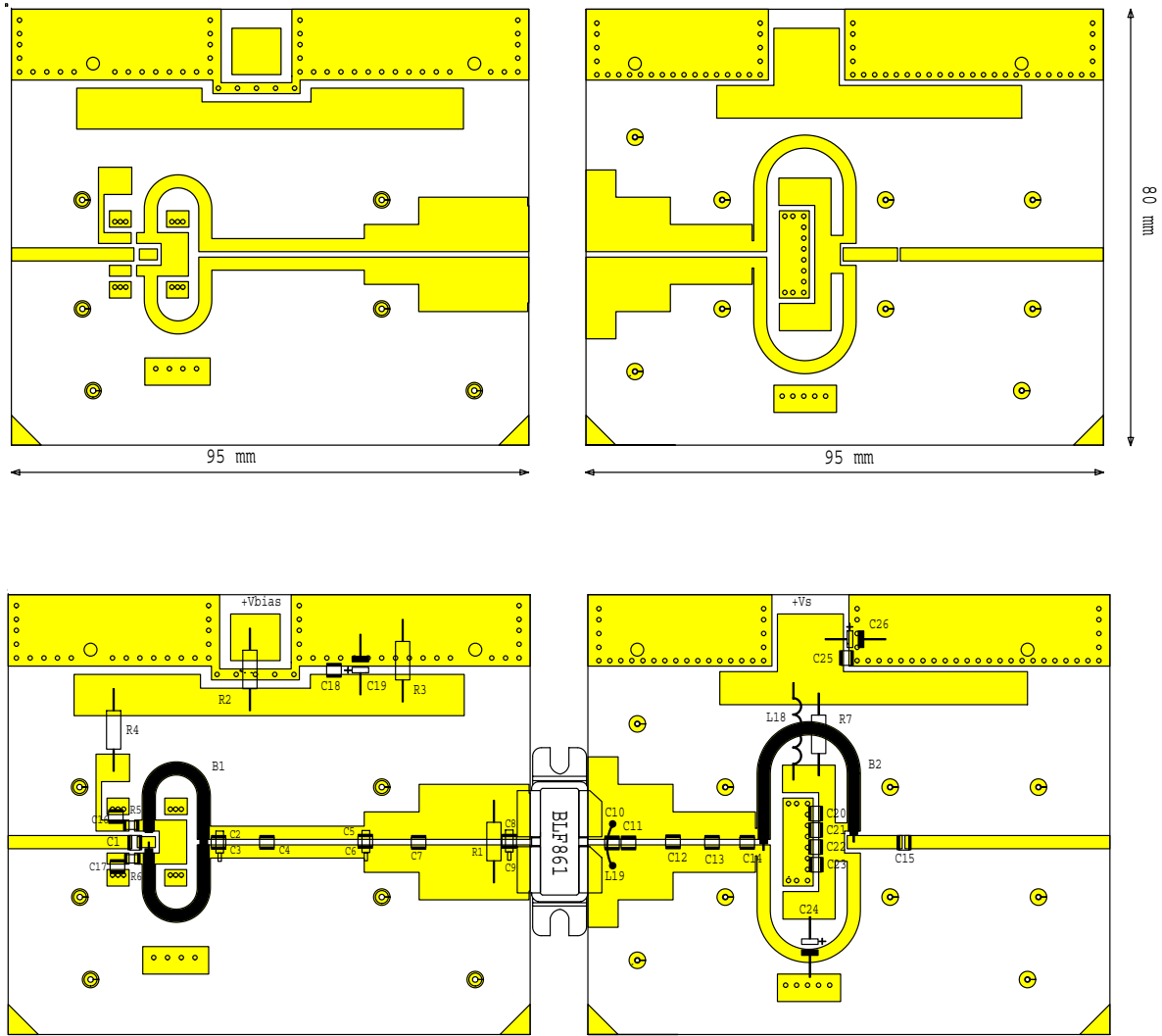
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C24	electrolytic capacitor	1000 $\mu$ F		
L1, L2	stripline; note 4		30.6 x 2.4 mm	
L3, L4	stripline; note 4		28 x 2.4 mm	
L5, L6	stripline; note 4		10 x 5 mm	
L7, L8	stripline; note 4		20 x 10 mm	
L9, L10	stripline; note 4		5.5 x 15 mm	
L11, L12	stripline; note 4		10 x 10 mm	
L13, L14	stripline; note 4		15 x 5 mm	
L15, L16	stripline; note 4		48.5 x 2.4 mm	
L17	stripline; note 4		10 x 2.4 mm	
L18	ferrite			
L19	wire inductor (hairpin)		height = 8 mm length = 20 mm	
B1	semi rigid coax balun UT70-25	$Z = 25 \Omega \pm 1.5 \Omega$	70 mm	
B2	semi rigid coax balun UT70-25	$Z = 25 \Omega \pm 1.5 \Omega$	48.5 mm	
R1, R7	resistor	10 $\Omega$		
R2	resistor	1 k $\Omega$		
R3	resistor	100 k $\Omega$		
R4	resistor	100 $\Omega$		
R5, R6	SMD resistor	3.9 $\Omega$		

**Notes**

1. American Technical Ceramics type 100A or capacitor of same quality.
2. American Technical Ceramics type 180R or capacitor of same quality.
3. American Technical Ceramics type 100B or capacitor of same quality.
4. The striplines are on a double copper-clad printed-circuit board: Rogers 5880 ( $\epsilon_r = 2.2$ ); thickness 0.79 mm.

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Dimensions in mm.

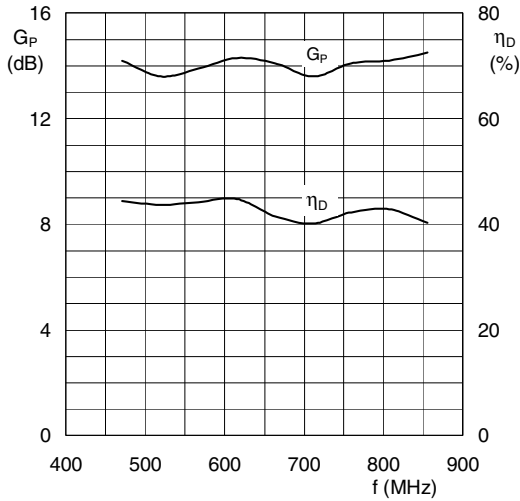
The components are situated on one side of the Rogers 5880 printed circuit board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.9 Printed-circuit board and component layout for the class-AB broadband testcircuit.



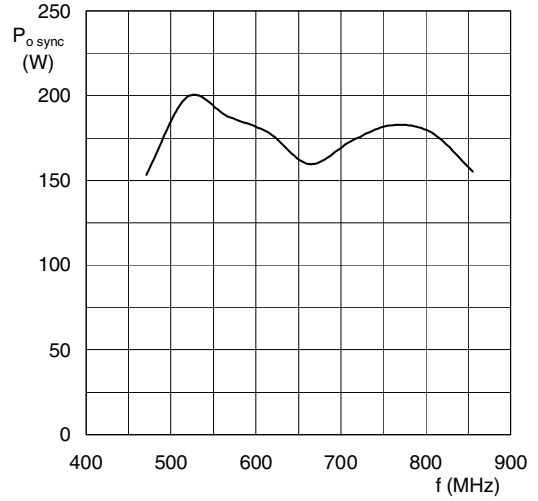
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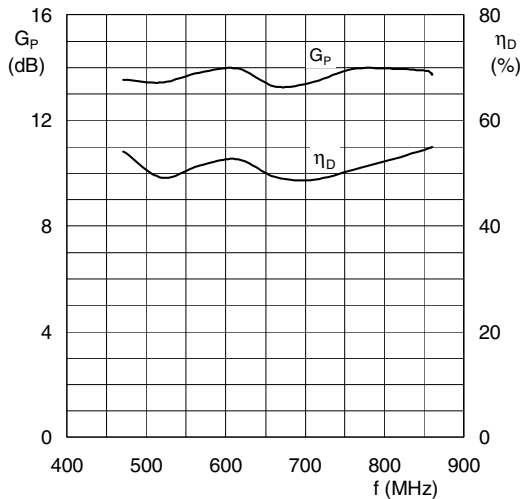
$T_h = 25\text{ }^\circ\text{C}$ ;  $V_{CE} = 32\text{V}$ ;  $I_{DQ} = 1.15\text{A}$ ; PAL BG signal (TV);  
 Sync compression: input 33 %, output 27 %;  
 measured in broadband testcircuit.

Fig.10 Power gain and drain efficiency as functions of frequency; typical values.



$T_h = 25\text{ }^\circ\text{C}$ ;  $V_{CE} = 32\text{V}$ ;  $I_{DQ} = 1.15\text{A}$ ; PAL BG signal (TV);  
 Sync compression: input 33 %, output 27 %;  
 measured in broadband testcircuit.

Fig.11 Peak envelope sync power as a function of frequency; typical values.



$T_h = 25\text{ }^\circ\text{C}$ ;  $V_{DS} = 32\text{V}$ ;  $I_{DQ} = 1.15\text{A}$ ; CW class-AB;  $P_L = 150\text{ W}$   
 measured in broadband testcircuit.

Fig.12 Power gain and drain efficiency as functions of frequency; typical values.

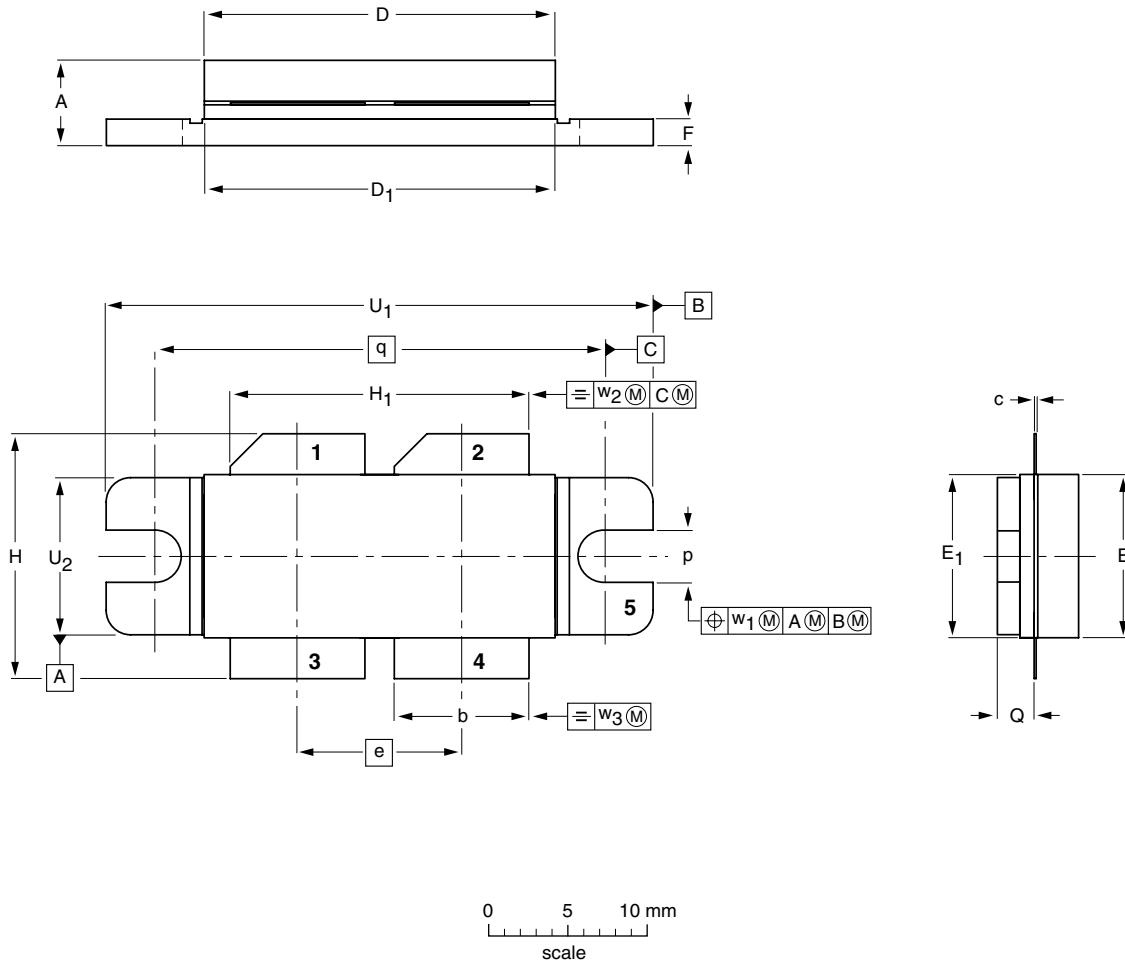
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PACKAGE OUTLINE

Flanged balanced LDMOST package; 2 mounting holes; 4 leads

SOT540A



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

UNIT	A	b	c	D	D <sub>1</sub>	e	E	E <sub>1</sub>	F	H	H <sub>1</sub>	p	Q	q	U <sub>1</sub>	U <sub>2</sub>	w <sub>1</sub>	w <sub>2</sub>	w <sub>3</sub>
mm	5.77 5.00	8.51 8.26	0.15 0.10	22.05 21.64	22.05 21.64	10.21	10.26 10.06	10.31 10.01	1.78 1.52	15.75 14.73	18.72 18.47	3.38 3.12	2.72 2.46	27.94	34.16 33.91	9.91 9.65	0.25	0.51	0.25
inches	0.227 0.197	0.335 0.325	0.006 0.004	0.868 0.852	0.868 0.852	0.402	0.404 0.396	0.406 0.394	0.070 0.060	0.620 0.580	0.737 0.727	0.133 0.123	0.107 0.097	1.100	1.345 1.335	0.390 0.380	0.010	0.020	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT540A						99-03-30 99-08-27

## UHF power LDMOS transistor

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**DEFINITIONS**

<b>Data Sheet Status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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Printed in The Netherlands

budgetnum/printrun/ed/pp12

Date of release: 1999 Aug 26

Document order number: 9397 750 06336

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