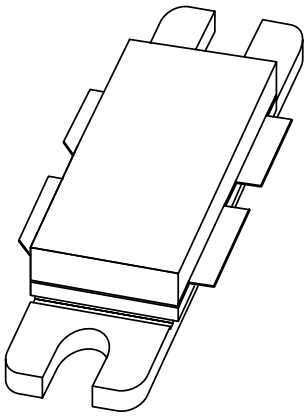
DATA SHEET



BLF861
UHF power LDMOS transistor

Preliminary specification

1999 Aug 26

Philips
Semiconductors

PHILIPS

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

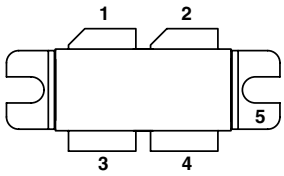


Fig.1 Simplified outline.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)	ΔG_p (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_{DS}	drain-source voltage		–	65	V
V_{GS}	gate-source voltage		–	±15	V
I_D	drain current (DC)		–	18	A
P_{tot}	total power dissipation	$T_{mb} \leq 25$ °C	–	318	W
T_{stg}	storage temperature		–65	+150	°C
T_j	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.

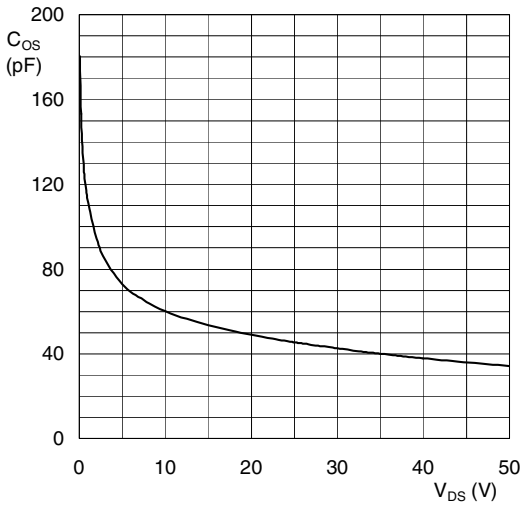
THERMAL CHARACTERISTICS

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

CHARACTERISTICS

T_j = 25 °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 mA	65	–	–	V
V_{GSth}	gate-source threshold voltage	V_{DS} = 10 V; I_D = 150 mA	4	–	5	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 32 V	–	–	10	μA
I_{DSX}	drain cut-off current	V_{GS} = V_{GSth} + 9 V; V_{DS} = 10 V	18	–	–	A
I_{GSS}	gate leakage current	V_{GS} = ±15 V; V_{DS} = 0	–	–	100	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 4 A	–	4	–	S
R_{DSon}	drain-source on-state resistance	V_{GS} = V_{GSth} + 9 V; I_D = 4 A	–	160	–	mΩ
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 32 V; f = 1 MHz	–	84	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 32 V; f = 1 MHz	–	42	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 32 V; f = 1 MHz	–	6	–	pF



V_{GS} = 0; f = 1 MHz; T_j = 25 °C.

Fig.2 Output capacitance as a function of drain-source voltage; typical values per section.

APPLICATION INFORMATION

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

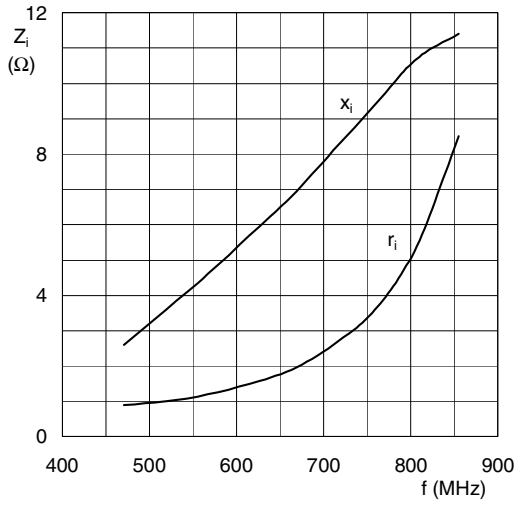
MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (A)	P_L (W)	G_p (dB)	η_D (%)	d_{IM} (dBc)	ΔG_p (dB)
CW, class-AB	860	32	1.15	150	>14	>50	–	≤1
2-tone, class-AB	f_1 = 860 f_1 = 860.1	32	1.15	150 (PEP)	>14	>40	≤–30	–
PAL BG (TV), class-AB	860 (ch 69)	32	1.15	typ.170 (peak sync)	>14	>40	–	note 1

Notes

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

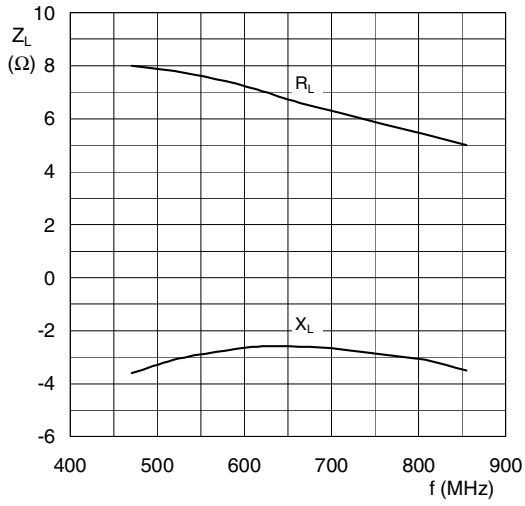
Ruggedness in class-AB operation

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



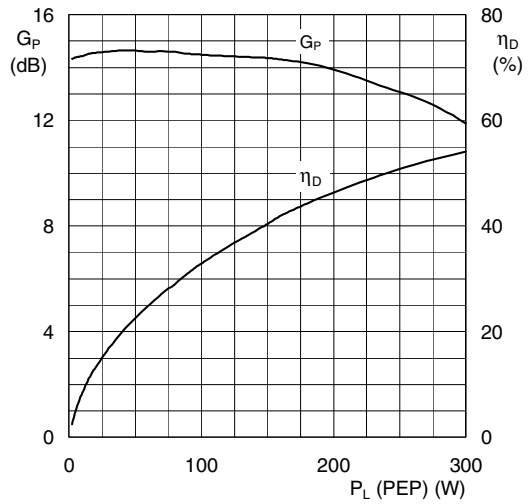
CW, class-AB operation; V_{DS} = 32 V; I_{DQ} = 1.15 A;
P_L = 170 W (total device) ; T_h = 25 °C.

Fig.3 Input impedance as a function of frequency (series components); typical values per section.



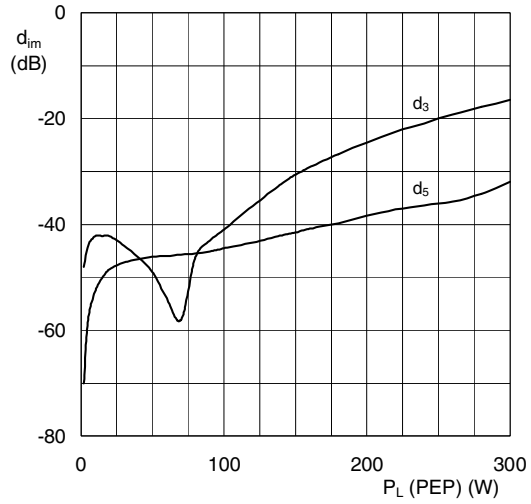
CW, class-AB operation; V_{DS} = 32 V; I_{DQ} = 1.15 A;
P_L = 170 W (total device) ; T_h = 25 °C.

Fig.4 Load impedance as a function of frequency (series components); typical values per section.



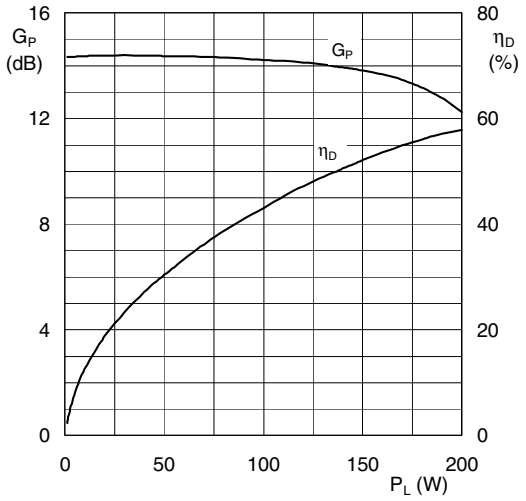
T_h = 25 °C; V_{DS} = 32V; I_{DQ} = 1.15 A;
2-tone: f_1 = 860 MHz (–6 dB); f_2 = 860.1 MHz (–6 dB)
measured in 860 MHz testcircuit.

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



T_h = 25 °C; V_{DS} = 32 V; I_{DQ} = 1.15 A;
2-tone: f_1 = 860 MHz (–6 dB); f_2 = 860.1 MHz (–6 dB)
measured in 860 MHz testcircuit.

Fig.6 Intermodulation distortion as a function of peak envelope output power; typical values.



T_h = 25 °C; V_{DS} = 32 V; ; I_{DQ} = 1.15 A; CW, class-AB; f = 860 MHz;
measured in 860 MHz testcircuit.

Fig.7 Power gain and drain efficiency as functions of load power; typical values.

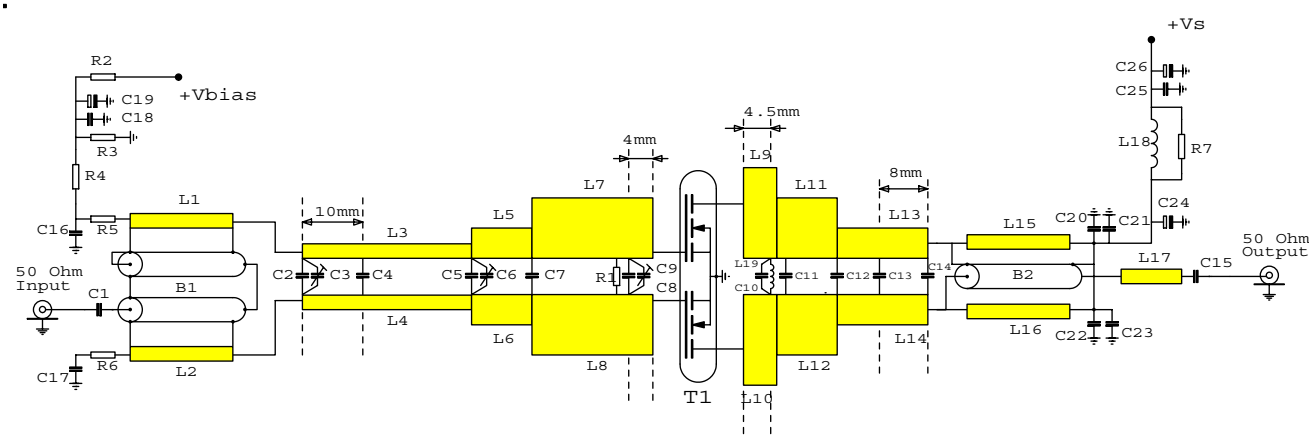


Fig.8 Class-AB broadband testcircuit.

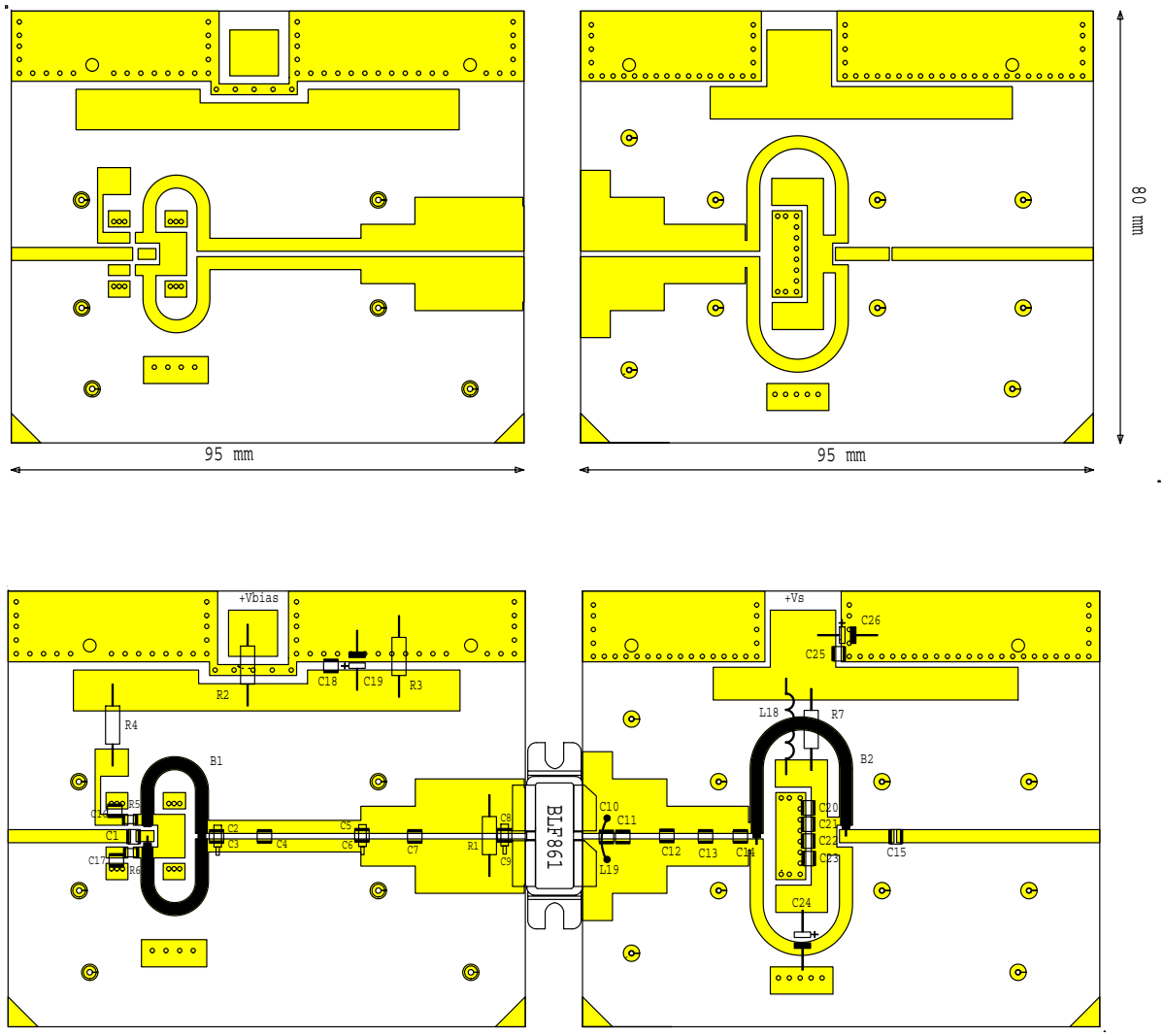
List of components

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		

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C24	electrolytic capacitor	1000 μF		
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 Ω ±1.5 Ω	70 mm	
B2	semi rigid coax balun UT70-25	Z = 25 Ω ±1.5 Ω	48.5 mm	
R1, R7	resistor	10 Ω		
R2	resistor	1 kΩ		
R3	resistor	100 kΩ		
R4	resistor	100 Ω		
R5, R6	SMD resistor	3.9 Ω		

Notes

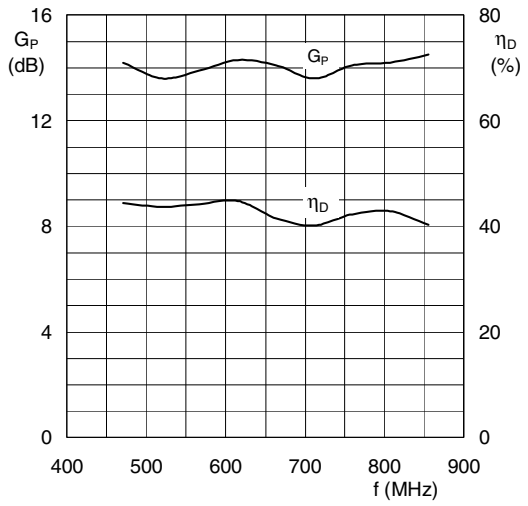
1. American Technical Ceramics type 100A or capacitor of same quality.
2. American Technical Ceramics type 180R or capacitor of same quality.
3. American Technical Ceramics type 100B or capacitor of same quality.
4. The striplines are on a double copper-clad printed-circuit board: Rogers 5880 (ε_r =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



Dimensions in mm.

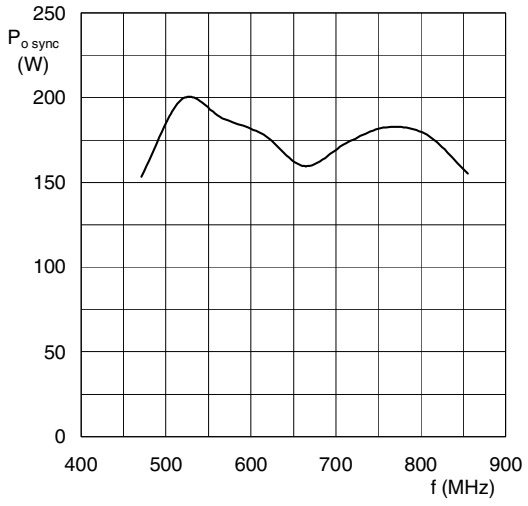
The components are situated on one side of the Rogers 5880 printed circuit board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

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



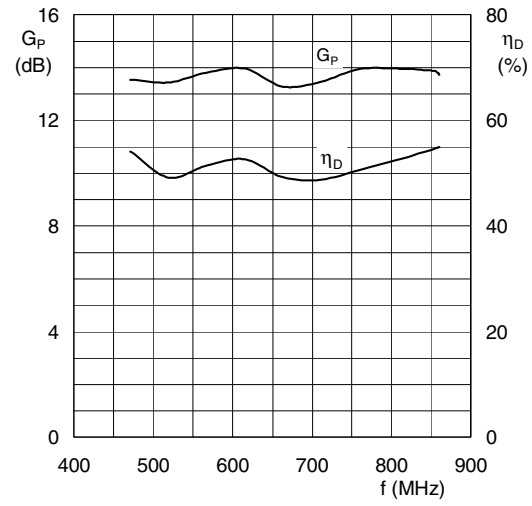
T_h = 25 °C; V_{CE} = 32V; I_{DQ} = 1.15A; PAL BG signal (TV);
Sync compression: input 33 %, output 27 %;
measured in broadband testcircuit.

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



T_h = 25 °C; V_{CE} = 32V; I_{DQ} = 1.15A; 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.

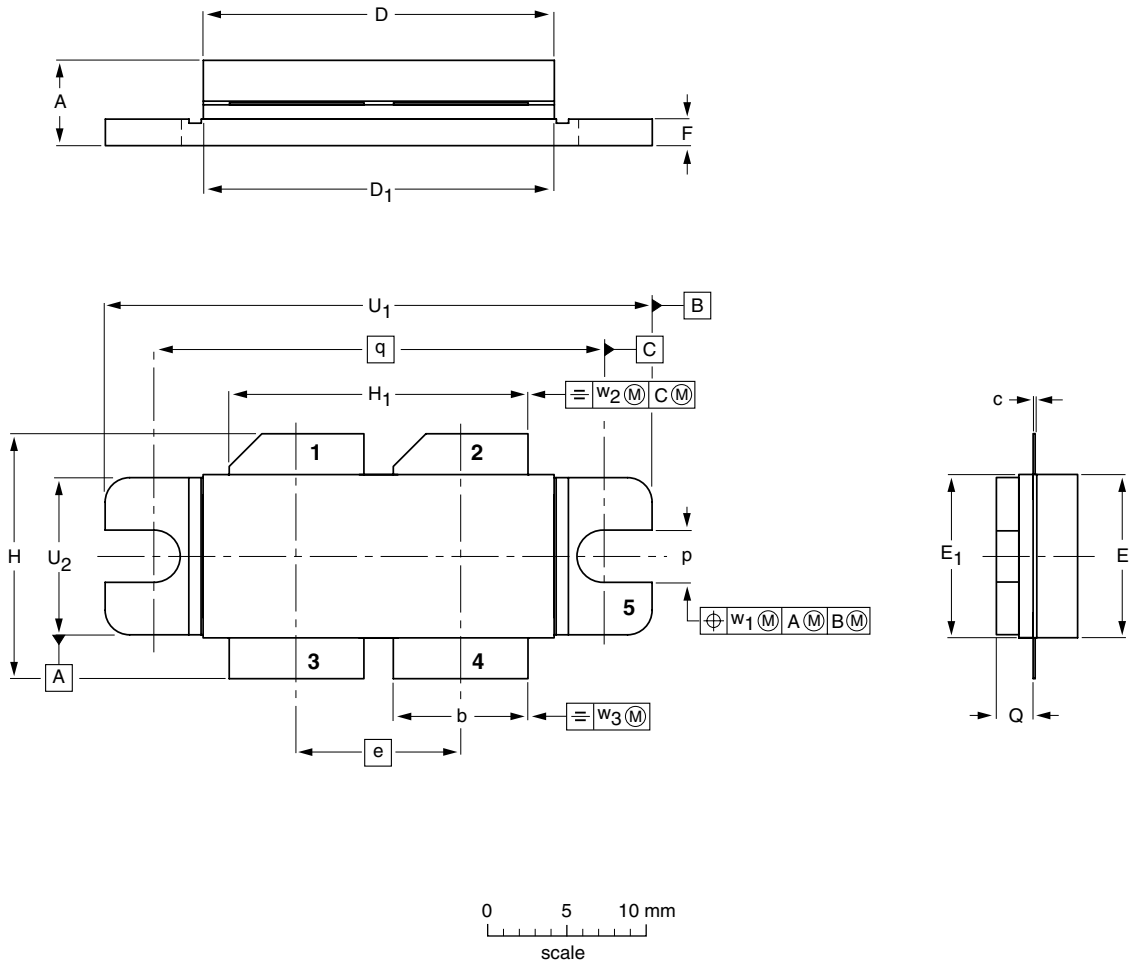


T_h = 25 °C; V_{DS}= 32V; I_{DQ} = 1.15 A; CW class-AB; P_L = 150 W
measured in broadband testcircuit.

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

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_1	e	E	E_1	F	H	H_1	p	Q	q	U_1	U_2	w_1	w_2	w_3
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

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.
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.	

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