

BLF369

VHF power LDMOS transistor

Rev. 01 — 13 April 2006

Objective data sheet

1. Product profile

1.1 General description

A 500 W LDMOS RF Power transistor for broadcast transmitter applications and industrial applications in the HF/VHF band.

Table 1: Typical performance

Typical RF performance at $V_{DS} = 32$ V and $T_h = 25$ °C in a common-source 225 MHz test circuit.^[1]

Mode of operation	f (MHz)	P_L (W)	$P_{L(PEP)}$ (W)	G_p (dB)	η_D (%)	IMD3 (dBc)
CW, class AB	225	500	-	18	60	-
2-tone, class AB	$f_1 = 225$; $f_2 = 225.1$	-	500	19	47	-28

[1] T_h is the heatsink temperature.

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features

- Typical CW performance at 225 MHz, a drain-source voltage V_{DS} of 32 V and a quiescent drain current $I_{DQ} = 2 \times 1.0$ A:
 - ◆ Load power $P_L = 500$ W
 - ◆ Gain $G_p \geq 18$ dB
 - ◆ Drain efficiency $\eta_D = 60$ %
- Advanced flange material for optimum thermal behavior and reliability
- Excellent ruggedness
- High power gain
- Designed for broadband operation (HF/VHF band)
- Source on underside eliminates DC isolators, reducing common-mode inductance
- Easy power control

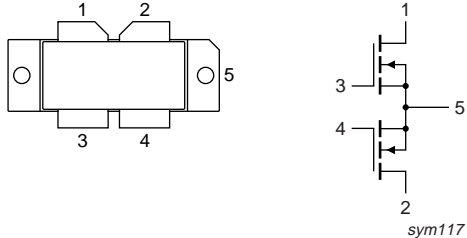
1.3 Applications

- Communication transmitter applications in the UHF band
- Industrial applications in the UHF band

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2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	gate1		
2	gate2		
3	drain1		
4	drain2		
5	source		

[1] Connected to flange.

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
BLF369	-	flanged LDMOST ceramic package; 2 mounting holes; 4 leads	SOT800-2

4. Limiting values

Table 4: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage		-	65	V
V_{GS}	gate-source voltage		-	± 13	V
T_{stg}	storage temperature		-65	+150	$^{\circ}C$
T_j	junction temperature		-	200	$^{\circ}C$

5. Thermal characteristics

Table 5: Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_j = 200\text{ }^{\circ}C$	[1][2] 0.26	K/W
$R_{th(j-h)}$	thermal resistance from junction to heatsink	$T_j = 200\text{ }^{\circ}C$	[1][2][3] 0.35	K/W

[1] T_j is the junction temperature.
[2] $R_{th(j-c)}$ and $R_{th(j-h)}$ are measured under RF conditions
[3] $R_{th(j-h)}$ is dependent on the applied thermal compound and clamping/mounting of the device.

6. Characteristics

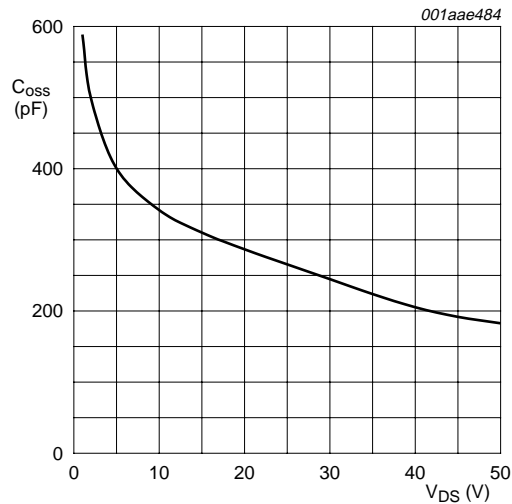
Table 6: Characteristics

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

Symbol	Parameter	Conditions ^[1]	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 6\text{ mA}$	65	-	-	V
V_{GSth}	gate-source threshold voltage	$V_{DS} = 20\text{ V}; I_D = 600\text{ mA}$	4	-	5.5	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}$	-	-	4.2	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GSth} + 9\text{ V}; V_{DS} = 10\text{ V}$	-	100	-	A
I_{GSS}	gate leakage current	$V_{GS} = 20\text{ V}; V_{DS} = 0\text{ V}$	-	-	60	nA
g_{fs}	forward transconductance	$V_{GS} = 20\text{ V}; I_D = 13\text{ A}$	-	15	-	S
R_{DSon}	drain-source on-state resistance	$V_{GS} = V_{GSth} + 9\text{ V}; I_D = 13\text{ A}$	-	40	-	m Ω
C_{iss}	input capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	^[2] -	400	-	pF
C_{oss}	output capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	^[2] -	230	-	pF
C_{rss}	reverse transfer capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	-	15	-	pF

[1] I_D is the drain current.

[2] C_{iss} and C_{oss} include reverse transfer capacitance (C_{rss}).



$V_{GS} = 0\text{ V}; f = 1\text{ MHz}$.

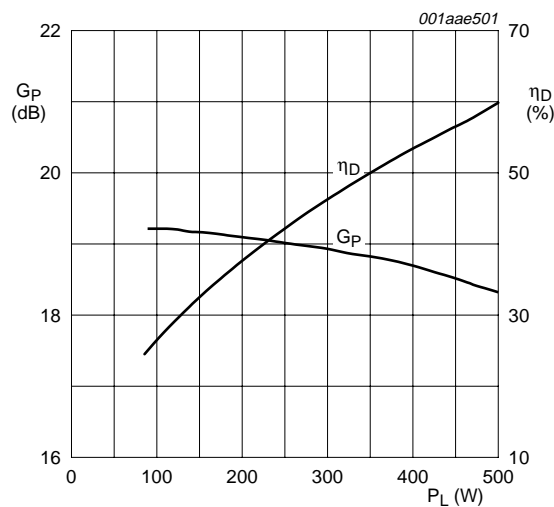
Fig 1. Output capacitance C_{oss} as a function of drain-source voltage V_{DS} ; typical values per section

7. Application information

Table 7: RF performance in a common-source 225 MHz test circuit

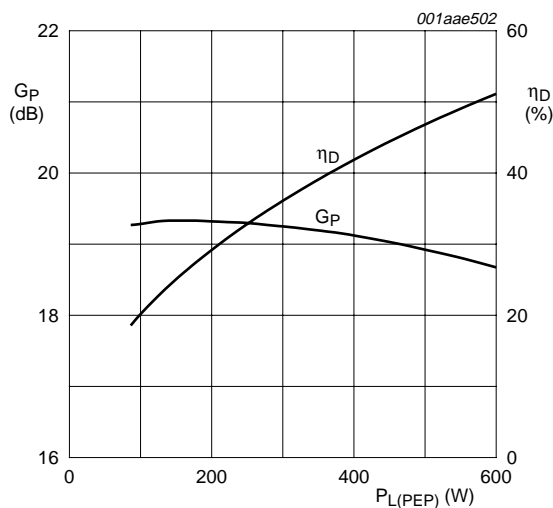
$T_h = 25^\circ\text{C}$ unless otherwise specified.

Mode of operation	f (MHz)	V_{DS} (V)	I_{DQ} (A)	$P_{L(PEP)}$ (W)	G_p (dB)	η_D (%)	IMD3 (dBc)	ΔG_p (dB)
2-tone, class AB	$f_1 = 225; f_2 = 225.1$	32	2×1.0	300	> 18	> 43	< -24	1



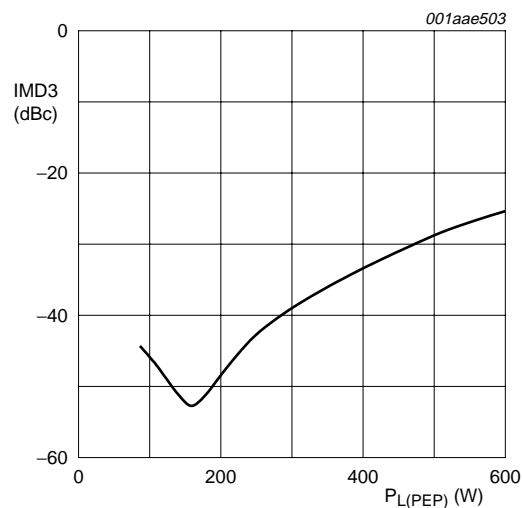
$V_{DS} = 32\text{ V}$; $f = 225\text{ MHz}$; $I_{DQ} = 2 \times 1.0\text{ A}$; $T_h = 25\text{ }^\circ\text{C}$.

Fig 2. CW power gain G_P and drain efficiency η_D as a function of output power P_L ; typical values



$V_{DS} = 32\text{ V}$; $f_1 = 225\text{ MHz}$; $f_2 = 225.1\text{ MHz}$;
 $I_{DQ} = 2 \times 1.0\text{ A}$; $T_h = 25\text{ }^\circ\text{C}$.

Fig 3. 2-tone power gain G_P and drain efficiency η_D as a function of peak envelope power $P_{L(PEP)}$; typical values



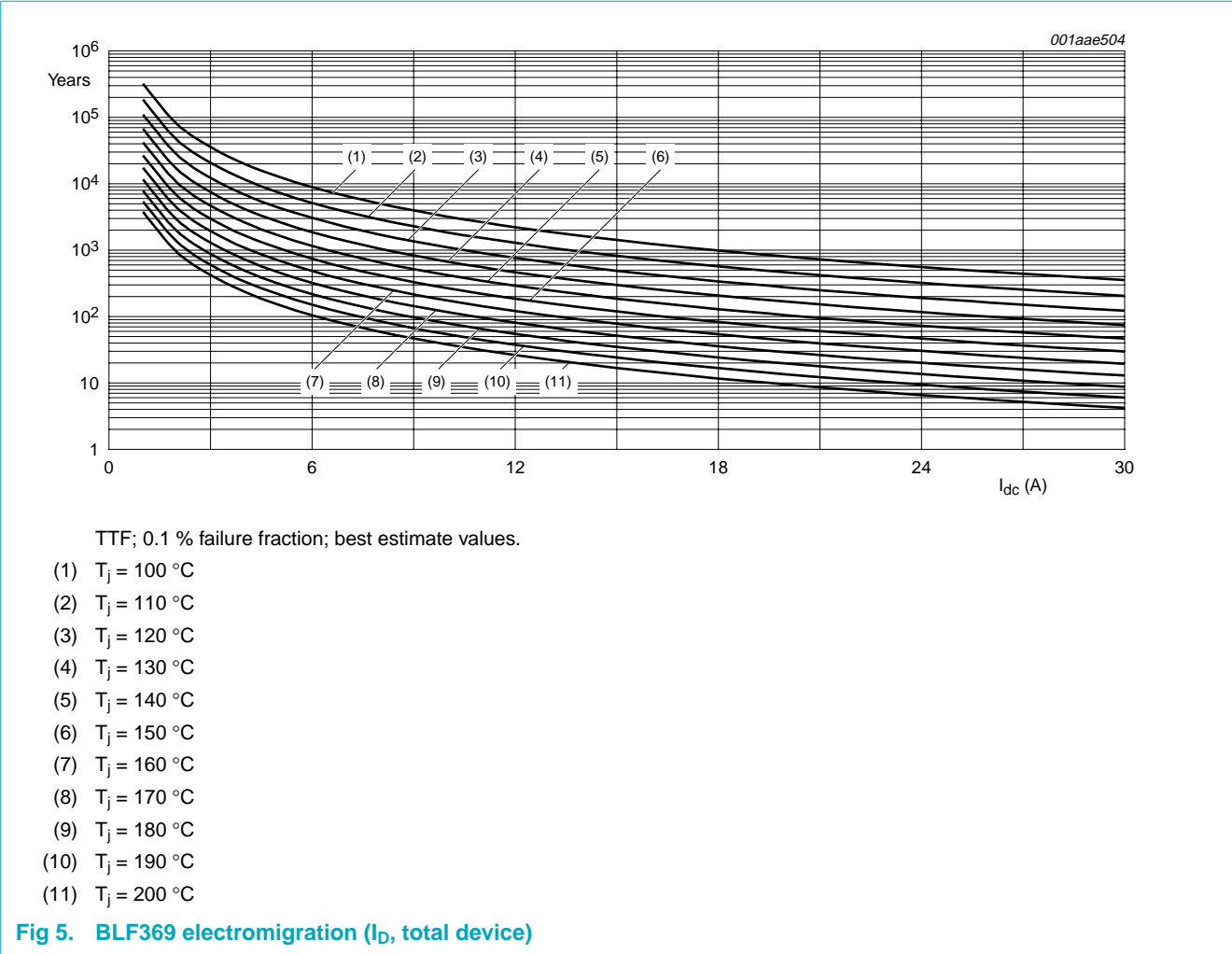
$V_{DS} = 32\text{ V}$; $f_1 = 225\text{ MHz}$; $f_2 = 225.1\text{ MHz}$;
 $I_{DQ} = 2 \times 1.0\text{ A}$; $T_h = 25\text{ }^\circ\text{C}$.

Fig 4. 2-tone third order intermodulation distortion IMD_3 as a function of peak envelope power $P_{L(PEP)}$; typical values

7.1 Ruggedness in class-AB operation

The BLF369 is capable of withstanding a load mismatch corresponding to $VSWR = 10 : 1$ through all phases under the following conditions: $V_{DS} = 32\text{ V}$; $f = 225\text{ MHz}$ at rated load power ($P_{L(PEP)} = 500\text{ W}$).

7.2 Reliability



8. Test information

Table 8: List of components
For test circuit, see [Figure 6](#), [7](#) and [8](#).

Component	Description	Value	Remarks
B1	semi rigid coax	25 Ω ; 120 mm	EZ90-25-TP
B2	semi rigid coax	25 Ω ; 56 mm	EZ90-25-TP
C1	multilayer ceramic chip capacitor	91 pF	[1]
C2, C3	multilayer ceramic chip capacitor	56 pF	[1]
C4, C7	multilayer ceramic chip capacitor	100 pF	[1]
C5, C8	ceramic capacitor	15 nF	
C6, C9	electrolytic capacitor	220 μ F	
C10, C11, C13, C14	multilayer ceramic chip capacitor	220 pF	[1]
C12, C15	ceramic capacitor	15 nF	[1]

Table 8: List of components ...continuedFor test circuit, see [Figure 6](#), [7](#) and [8](#).

Component	Description	Value	Remarks
C20	multilayer ceramic chip capacitor	100 pF	[1]
C21	multilayer ceramic chip capacitor	20 pF	[1]
C22, C25	multilayer ceramic chip capacitor	100 pF	[1]
C23, C26	ceramic capacitor	15 nF	
C24, C27	electrolytic capacitor	10 μ F	
C28, C31	multilayer ceramic chip capacitor	100 pF	[1]
C29, C32	multilayer ceramic chip capacitor	220 pF	
C30, C33	ceramic capacitor	15 nF	
L1, L3	stripline		[2] (W \times L) 12 mm \times 15 mm
L2, L4	air coil		4 windings; D = 8 mm; d = 1 mm
L5, L6	stripline		[2] (W \times L) 14 mm \times 15 mm
R1, R2, R3, R4	resistor	0.25 W; 4 Ω	
R5, R6, R8, R9	resistor	0.25 W; 10 Ω	
R7, R10	potentiometer	10 k Ω	
R11, R12	resistor	0.25 W; 1 Ω	
T1, T2	semi rigid coax	25 Ω ; 68 mm	EZ90-25-TP
T3, T4	semi rigid coax	25 Ω ; 60 mm	EZ90-25-TP

[1] American technical ceramics type 100B or capacitor of same quality.

[2] PCB: Rogers 5880; $\epsilon_r = 2.2$ F/m; height = 0.79 mm; Cu (top/bottom metallization); thickness copper plating = 35 μ m.

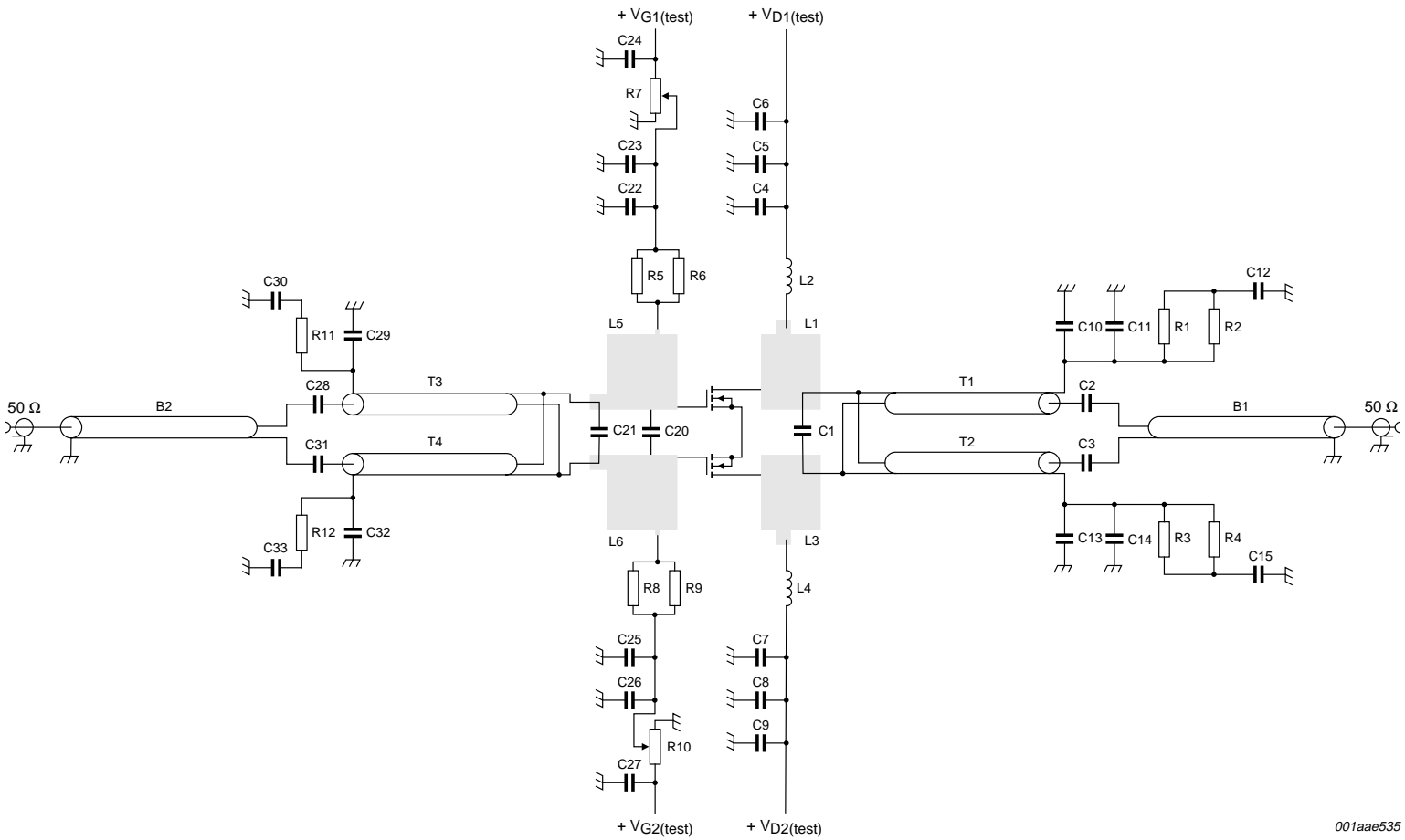


Fig 6. Class-AB common-source 225 MHz test circuit; $V_{D1(test)}$, $V_{D2(test)}$, $V_{G1(test)}$ and $V_{G2(test)}$ are drain and gate test voltages

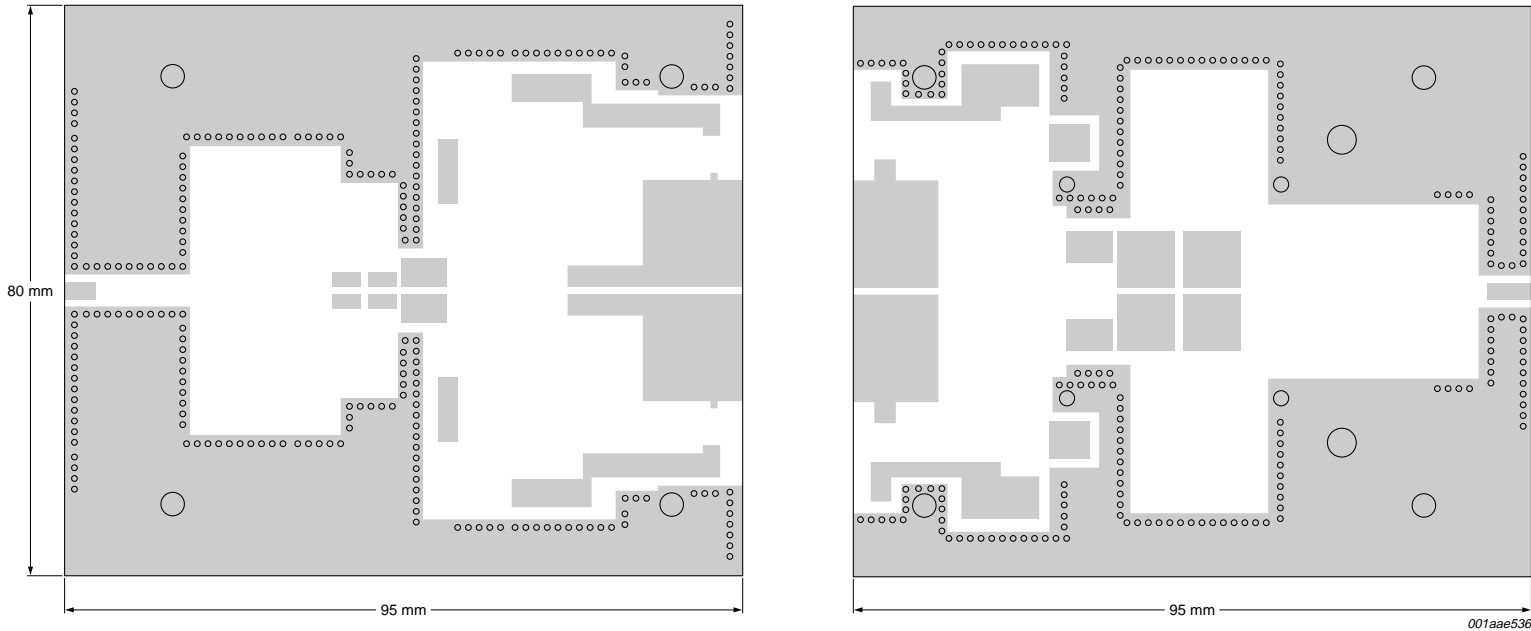
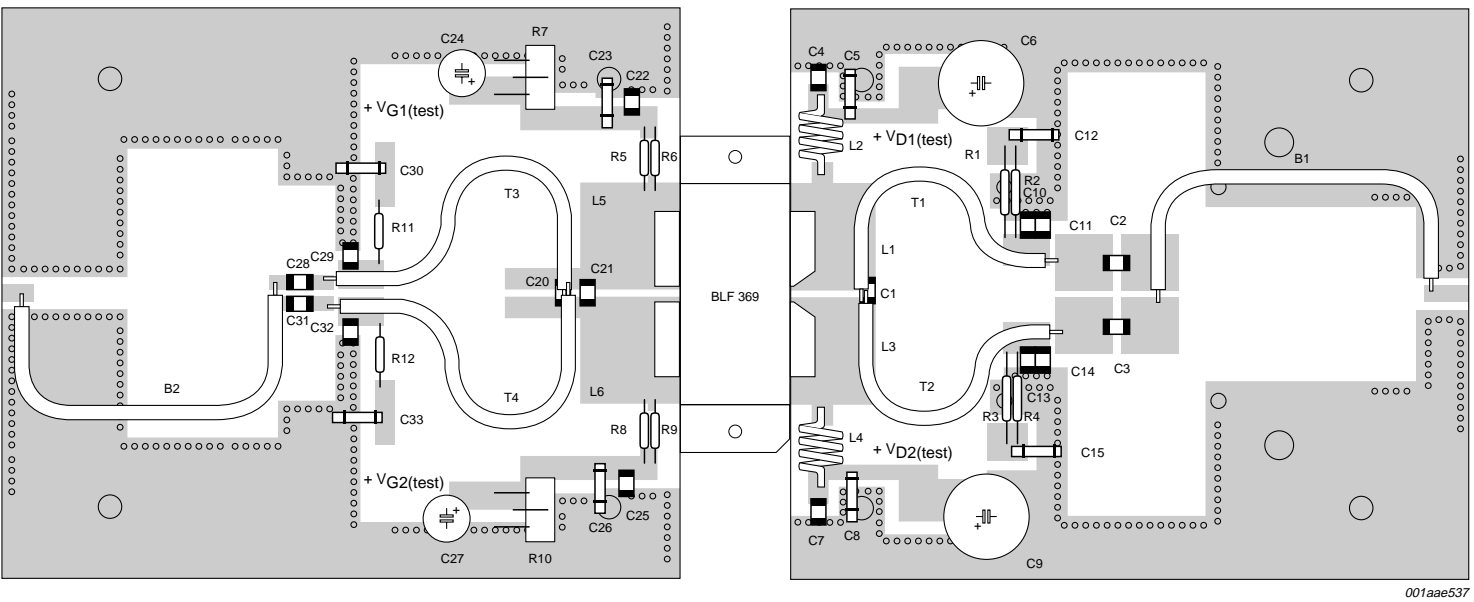


Fig 7. Printed-circuit board for class-AB 225 MHz test circuit



C1 mounted on top of transformers T1 and T2; C20 mounted on top of transformers T3 and T4

Fig 8. Component layout for class-AB 225 MHz test circuit

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 4 leads

SOT800-2

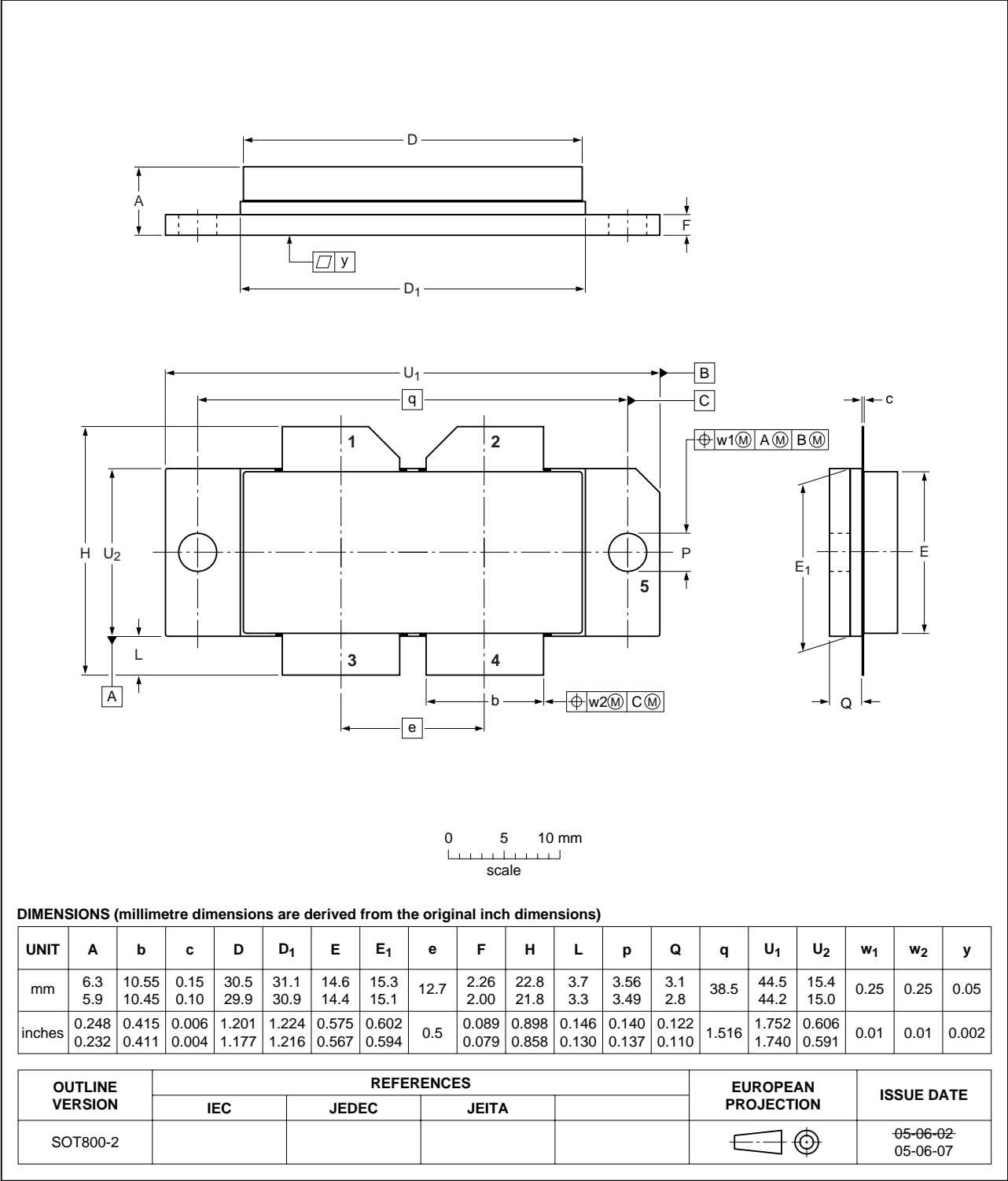


Fig 9. Package outline SOT800-2

10. Abbreviations

Table 9: Abbreviations

Acronym	Description
CW	Continuous Wave
GSM	Global System for Mobile communications
LDMOS	Laterally Diffused Metal Oxide Semiconductor
PCB	Printed-Circuit Board
PEP	Peak Envelope Power
RF	Radio Frequency
TTF	Time To Failure
VSWR	Voltage Standing Wave Ratio

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF369_1	20060413	Objective data sheet	-	-

12. Legal information

12.1 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".

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Date of release: 13 April 2006

Document identifier: BLF369_1