

BLF872

UHF power LDMOS transistor

Rev. 01 — 20 February 2006

Product data sheet

1. Product profile

1.1 General description

A 300 W LDMOS RF power transistor for broadcast transmitter applications and industrial applications. The transistor can deliver 250 W broadband over the full UHF band from 470 MHz to 860 MHz. The excellent ruggedness and broadband performance of this device makes it ideal for digital transmitter applications.

CAUTION



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

1.2 Features

- Typical 2-tone performance at 860 MHz, a drain-source voltage V_{DS} of 32 V and a quiescent drain current $I_{DQ} = 2 \times 0.9$ A:
 - ◆ Peak envelope power load power $P_{L(PEP)} = 300$ W
 - ◆ Gain $G_p = 15$ dB
 - ◆ Drain efficiency $\eta_D = 43$ %
 - ◆ Third order intermodulation distortion $IMD3 = -28$ dBc
- Typical DVB performance at 858 MHz, a drain-source voltage V_{DS} of 32 V and a quiescent drain current $I_{DQ} = 2 \times 0.9$ A:
 - ◆ Average output power $P_{L(AV)} = 70$ W
 - ◆ Gain $G_p = 15$ dB
 - ◆ Drain efficiency $\eta_D = 30$ %
 - ◆ Third order intermodulation distortion $IMD3 = -28$ dBc (4.3 MHz from center frequency)
- Advanced flange material for optimum thermal behavior and reliability
- Excellent ruggedness
- High power gain
- Designed for broadband operation (UHF band)
- Excellent reliability
- Internal input and output matching for high gain and optimum broadband operation
- Source on underside eliminates DC isolators, reducing common-mode inductance
- Easy power control

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1.3 Applications

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

1.4 Quick reference data

Table 1: Quick reference data

Typical RF performance at $V_{DS} = 32\text{ V}$ and $T_h = 25\text{ °C}$ in a common-source narrowband 860 MHz test circuit. [1]

Mode of operation	f (MHz)	P _L (W)	P _{L(PEP)} (W)	P _{L(AV)} (W)	G _p (dB)	η _D (%)	IMD3 (dBc)
CW, class AB	860	300	-	-	14	55	-
2-tone, class AB	f ₁ = 860; f ₂ = 860.1	-	300	-	15	42	-28
PAL BG	860 (ch69)	300 (peak sync.) [2]	-	-	15	42	-
DVB-T (8K OFDM)	858	-	-	70	15	30	-28 [3]

[1] T_h is the heatsink temperature.

[2] Black video signal, sync expansion: input sync = 33 %; output sync ≥ 27 %.

[3] Measured dBc at 4.3 MHz from center frequency.

2. Pinning information

Table 2: Pinning

Description	Pin	Simplified outline
drain 1	1	
drain 2	2	
gate 1	3	
gate 2	4	
source	5	

[1] Connected to flange.

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
BLF872	-	flanged LDMOST ceramic package; 2 mounting holes; 4 leads	SOT800-1

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	$^{\circ}\text{C}$
T_j	junction temperature		-	200	$^{\circ}\text{C}$

5. Thermal characteristics

Table 5: Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_h = 25\text{ }^{\circ}\text{C}$	[1] 0.32	K/W
$R_{th(j-h)}$	thermal resistance from junction to heatsink	$T_h = 25\text{ }^{\circ}\text{C}$	[1][2] 0.4	K/W

[1] T_h is the heatsink temperature.

[2] $R_{th(j-h)}$ is dependent on the applied thermal compound and clamping/mounting of the device.

6. Characteristics

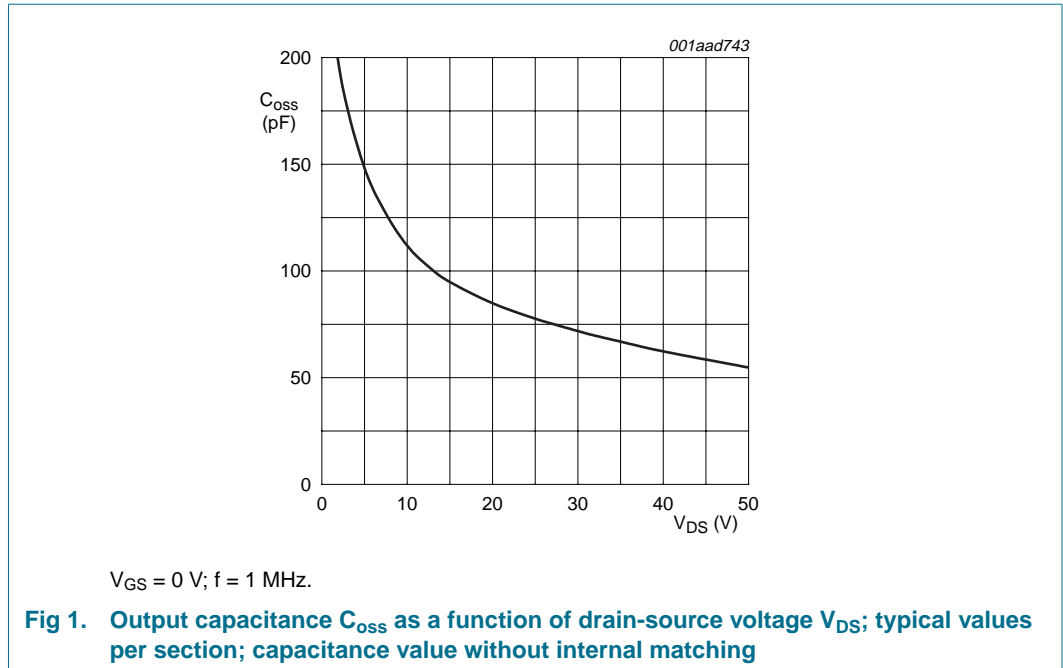
Table 6: Characteristics

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

Symbol	Parameter	Conditions [1]	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 5\text{ mA}$	65	-	-	V
V_{GSth}	gate-source threshold voltage	$V_{DS} = 20\text{ V}; I_D = 250\text{ mA}$	5.2	-	6.2	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}$	-	-	2.2	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GSth} + 6\text{ V}; V_{DS} = 10\text{ V}$	-	41	-	A
I_{GSS}	gate leakage current	$V_{GS} = 10\text{ V}; V_{DS} = 0\text{ V}$	-	-	40	nA
g_{fs}	forward transconductance	$V_{GS} = 20\text{ V}; I_D = 16\text{ A}$	-	10	-	S
R_{DSon}	drain-source on-state resistance	$V_{GS} = V_{GSth} + 6\text{ V}; I_D = 9\text{ A}$	-	80	-	m Ω
C_{iss}	input capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	[2] -	200	-	pF
C_{oss}	output capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	[2] -	70	-	pF
C_{rss}	reverse transfer capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	[2] -	2.5	-	pF

[1] I_D is the drain current.

[2] Capacitance values without internal matching.



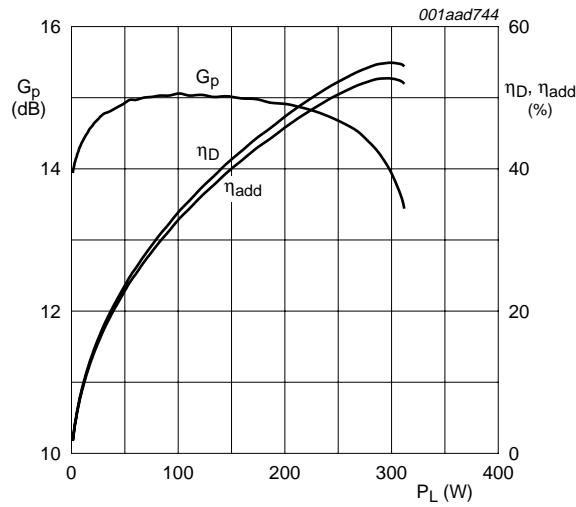
7. Application information

Table 7: RF performance in a common-source 860 MHz narrowband test circuit

$T_h = 25^\circ\text{C}$ unless otherwise specified. [1]

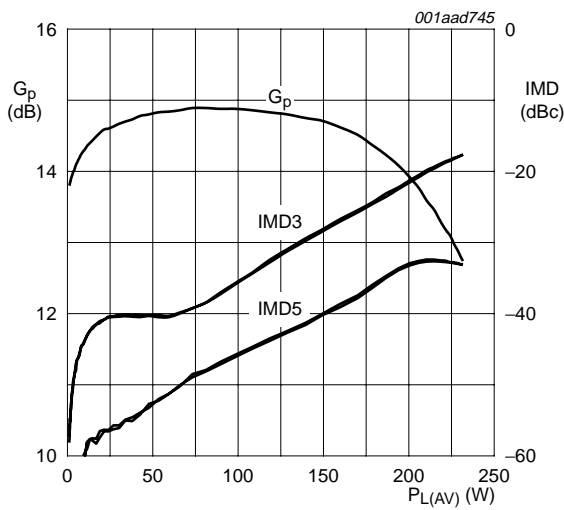
Mode of operation	f (MHz)	V_{DS} (V)	I_{DQ} (A)	$P_{L(PEP)}$ (W)	$P_{L(AV)}$ (W)	G_p (dB)	η_D (%)	IMD3 (dBc)	ΔG_p (dB)
2-tone, class AB	$f_1 = 860;$ $f_2 = 860.1$	32	2×0.9	300	-	> 14	> 40	≤ -25	≤ 1
DVB-T (8K OFDM)	858	32	2×0.9	-	70	> 14	> 26	≤ -25	-

[1] Sync. compression: input sync. $\geq 33\%$, output sync. 27 %.



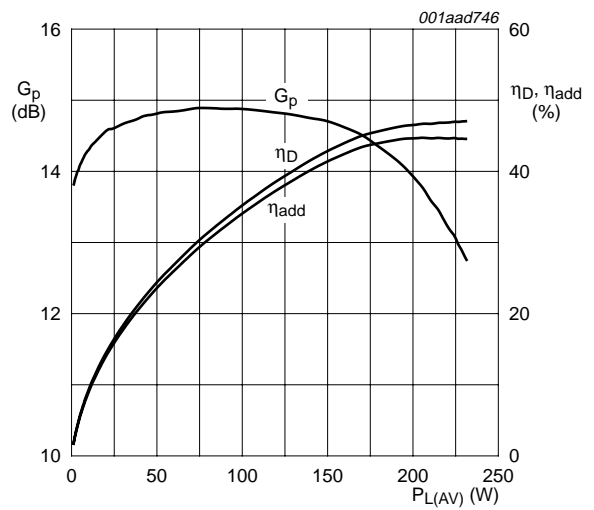
$V_{DS} = 32\text{ V}$; $f = 860\text{ MHz}$; $I_{Dq} = 2 \times 0.9\text{ A}$; $T_h = 25\text{ }^\circ\text{C}$.

Fig 2. CW power gain G_p , drain efficiency η_D and power added efficiency η_{add} as a function of output power P_L ; typical values



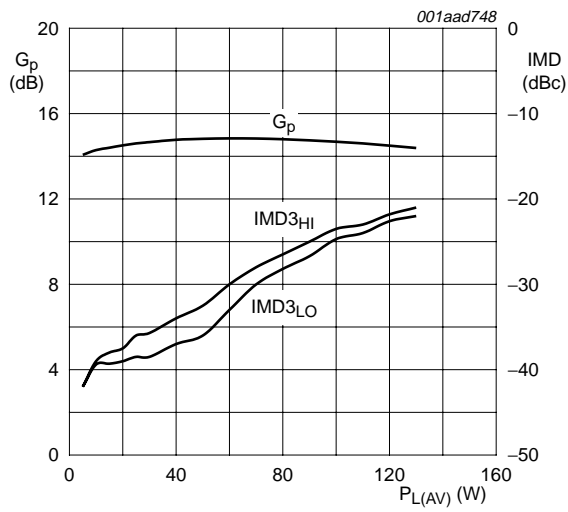
$V_{DS} = 32\text{ V}$; $f_1 = 860\text{ MHz}$; $f_2 = 860.1\text{ MHz}$;
 $I_{Dq} = 2 \times 0.9\text{ A}$; $T_h = 25\text{ }^\circ\text{C}$.

Fig 3. 2-tone power gain G_p and intermodulation distortion IMD as a function of average output power $P_{L(AV)}$; typical values



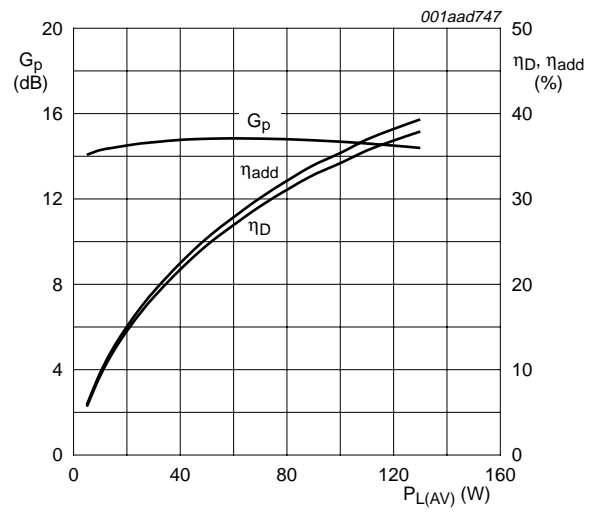
$V_{DS} = 32\text{ V}$; $f_1 = 860\text{ MHz}$; $f_2 = 860.1\text{ MHz}$;
 $I_{Dq} = 2 \times 0.9\text{ A}$; $T_h = 25\text{ }^\circ\text{C}$.

Fig 4. 2-tone power gain G_p , drain efficiency η_D and power added efficiency η_{add} as a function of average output power $P_{L(AV)}$; typical values



IMD at ± 4.3 MHz from frequency center.

Fig 5. DVB-T (8K OFDM) power gain G_p and third order intermodulation distortion (high-frequency component IMD_{3HI} and low-frequency component IMD_{3LO}) as a function of average output power $P_{L(AV)}$; typical values

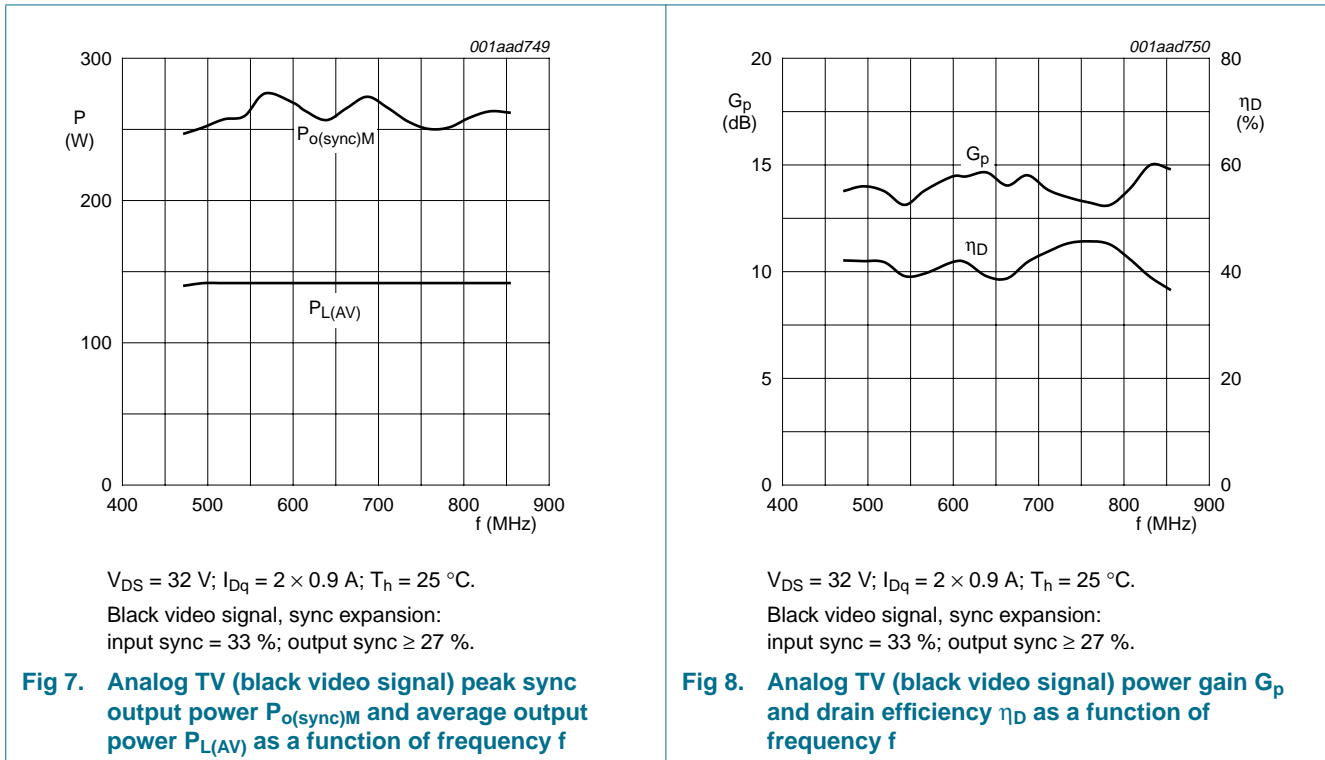


$V_{DS} = 32$ V; $f = 858$ MHz; $I_{Dq} = 2 \times 0.9$ A; $T_h = 25$ °C.

Fig 6. DVB-T (8K OFDM) power gain G_p , drain efficiency η_D and power added efficiency η_{add} as a function of average output power $P_{L(AV)}$; typical values

7.1 Broadband operation data

Measured in a common-source broadband (470 MHz to 860 MHz) test circuit.

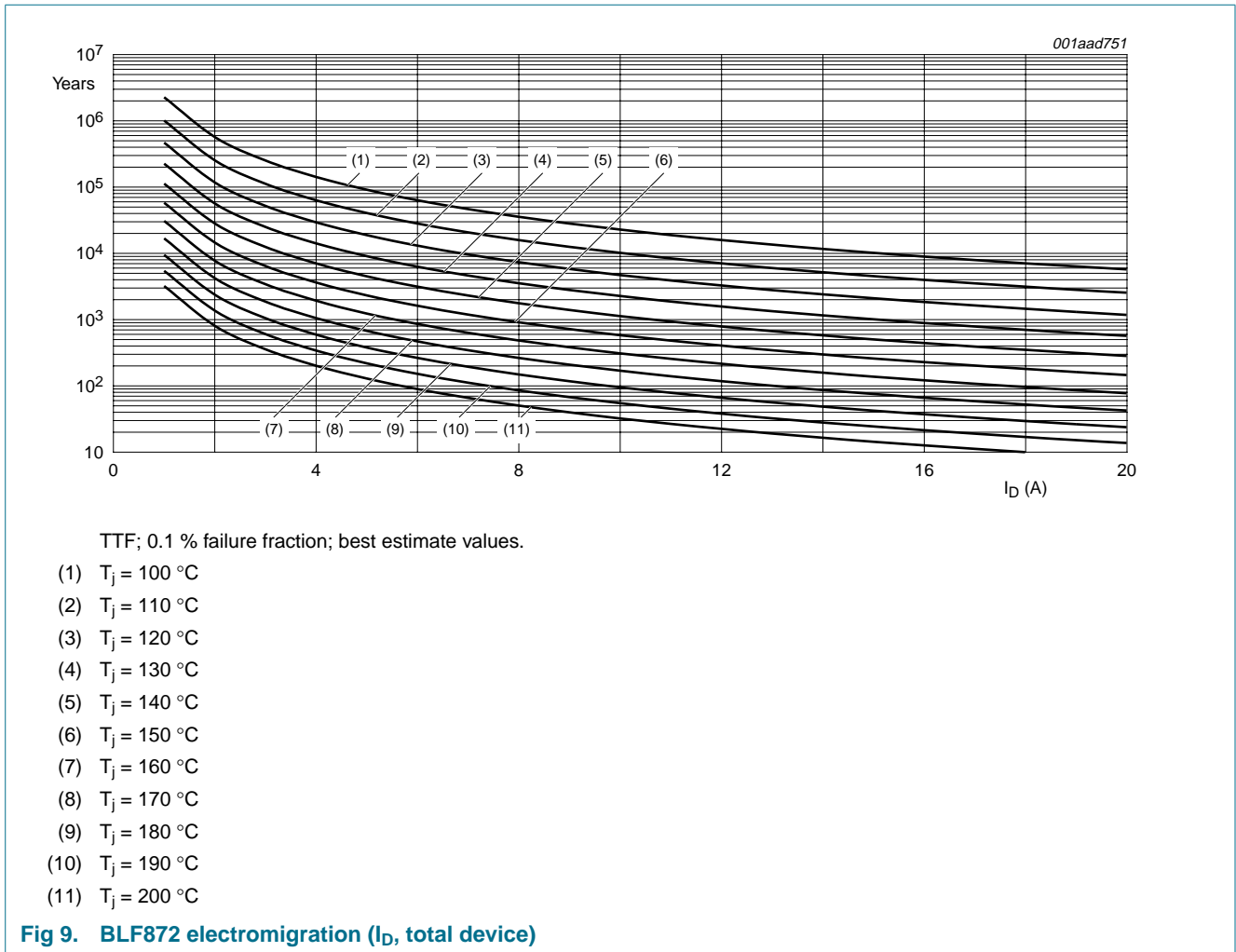


7.2 Ruggedness in class-AB operation

The BLF872 is capable of withstanding a load mismatch corresponding to $VSWR = 10 : 1$ through all phases under the following conditions: $V_{DS} = 32\text{ V}; f = 860\text{ MHz}$ at rated power.

Measured in a common-source broadband (470 MHz to 860 MHz) test circuit.

7.3 Reliability



8. Test information

Table 8: List of components

For test circuit, see Figure 10, 11 and 12.

Component	Description	Value	Remarks
B1, B2 balun	semi rigid coax	25 Ω	EZ90-25-TP
C1	multilayer ceramic chip capacitor	12 pF	[1]
C2	multilayer ceramic chip capacitor	10 pF	[1]
C3, C5	multilayer ceramic chip capacitor	5.6 pF	[1]
C4	multilayer ceramic chip capacitor	6.8 pF	[1]
C6, C7	multilayer ceramic chip capacitor	2.0 pF	[2]
C8	multilayer ceramic chip capacitor	18 pF	[1]
C9, C10	multilayer ceramic chip capacitor	0.5 pF	[2]
C11, C12	multilayer ceramic chip capacitor	100 pF	[1]
C13, C14	multilayer ceramic chip capacitor	100 pF	[2]

Table 8: List of components ...continued
For test circuit, see [Figure 10](#), [11](#) and [12](#).

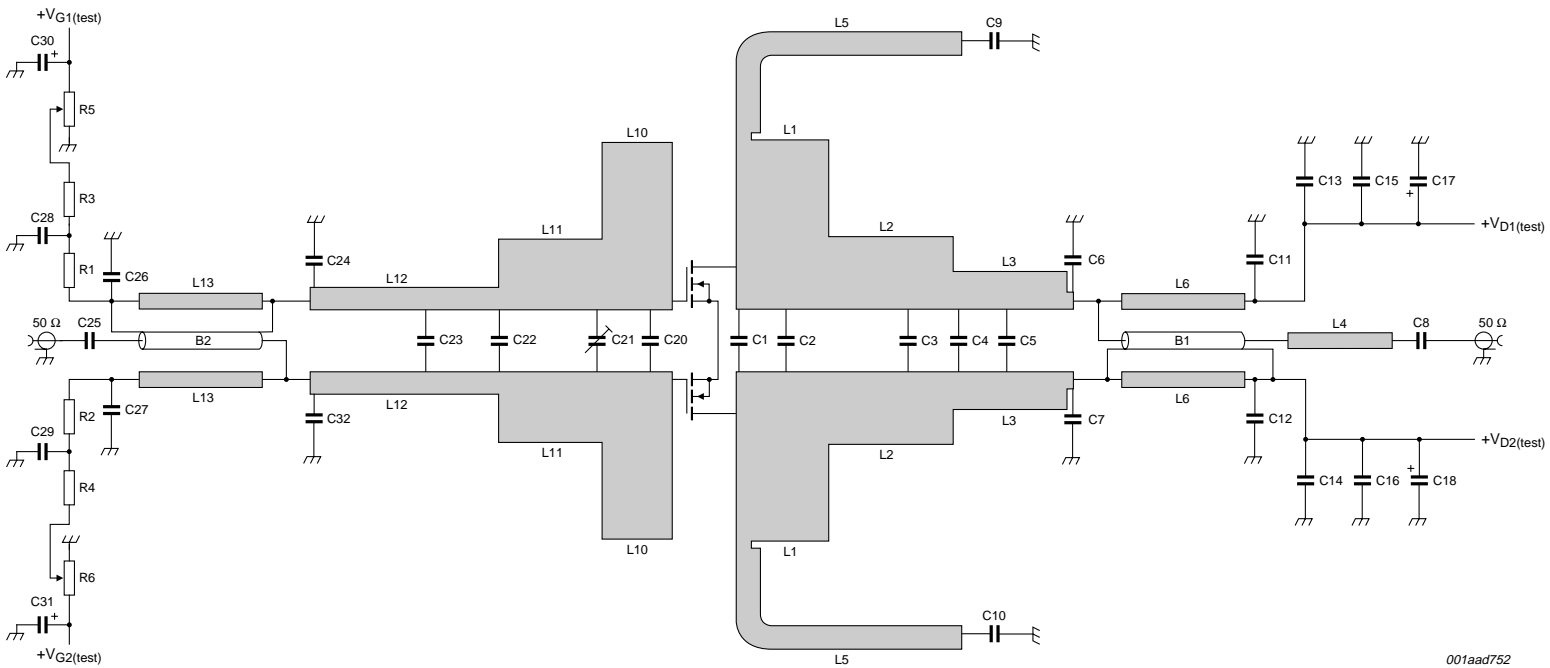
Component	Description	Value	Remarks
C15, C16	ceramic capacitor	15 nF	
C17, C18	electrolytic capacitor	470 μ F	
C20	multilayer ceramic chip capacitor	13 pF	[3]
C21	tekelec trimmer	0.6 pF to 4.5 pF	
C22	multilayer ceramic chip capacitor	3.9 pF	[3]
C23	multilayer ceramic chip capacitor	10 pF	[3]
C24, C32	multilayer ceramic chip capacitor	3.0 pF	[3]
C25	multilayer ceramic chip capacitor	30 pF	[3]
C26, C27	multilayer ceramic chip capacitor	100 pF	[3]
C28, C29	ceramic capacitor	15 nF	
C30, C31	electrolytic capacitor	10 μ F	
L1	stripline		[4] (W \times L) 24 mm \times 13.1 mm
L2	stripline		[4] (W \times L) 10 mm \times 17.7 mm
L3	stripline		[4] (W \times L) 5 mm \times 16.5 mm
L4	stripline		[4] (W \times L) 2.4 mm \times 15 mm
L5	stripline		[4] (W \times L) 3.5 mm \times 43 mm
L6	stripline		[4] (W \times L) 2 mm \times 43.3 mm
L10	stripline		[4] (W \times L) 24 mm \times 10 mm
L11	stripline		[4] (W \times L) 10 mm \times 15 mm
L12	stripline		[4] (W \times L) 3 mm \times 31.5 mm
L13	stripline		[4] (W \times L) 2 mm \times 43.3 mm
R1	resistor	5.6 Ω	
R2	resistor	5.6 Ω	
R3	resistor	100 Ω	
R4	resistor	100 Ω	
R5	potentiometer	2 k Ω	
R6	potentiometer	2 k Ω	

[1] American technical ceramics type 180R or capacitor of same quality.

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

[3] American technical ceramics type 100A or capacitor of same quality.

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



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Fig 10. Class-AB common-source broadband test circuit; $V_{D1(test)}$, $V_{D2(test)}$, $V_{G1(test)}$ and $V_{G2(test)}$ are drain and gate test voltages

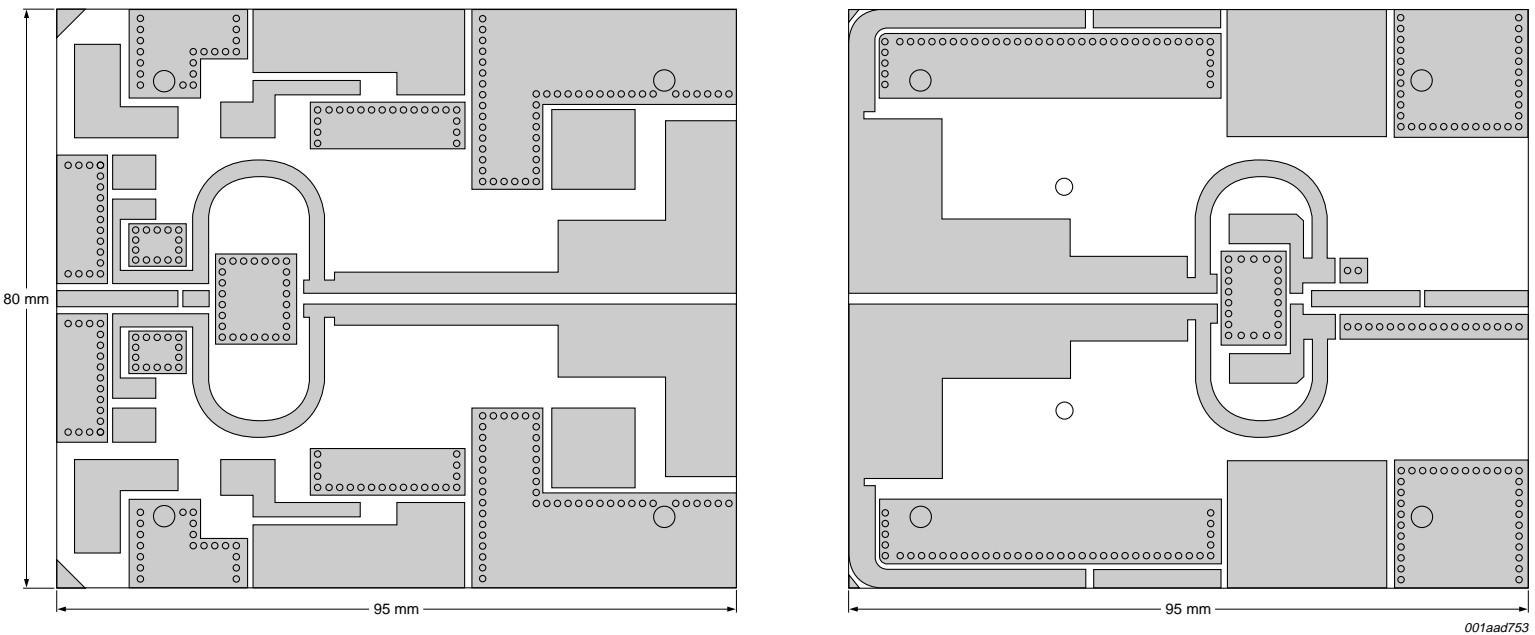


Fig 11. Printed-circuit board for class-AB broadband test circuit

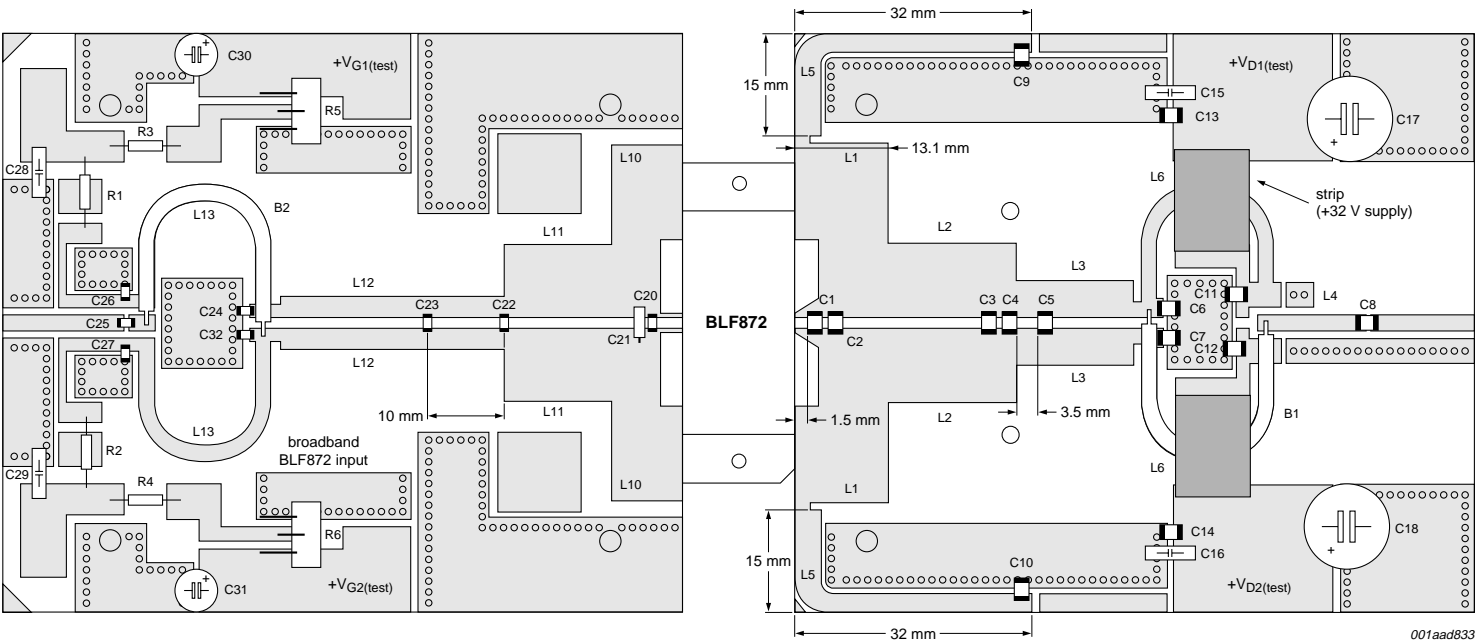


Fig 12. Component layout for class-AB broadband test circuit

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 4 leads

SOT800-1

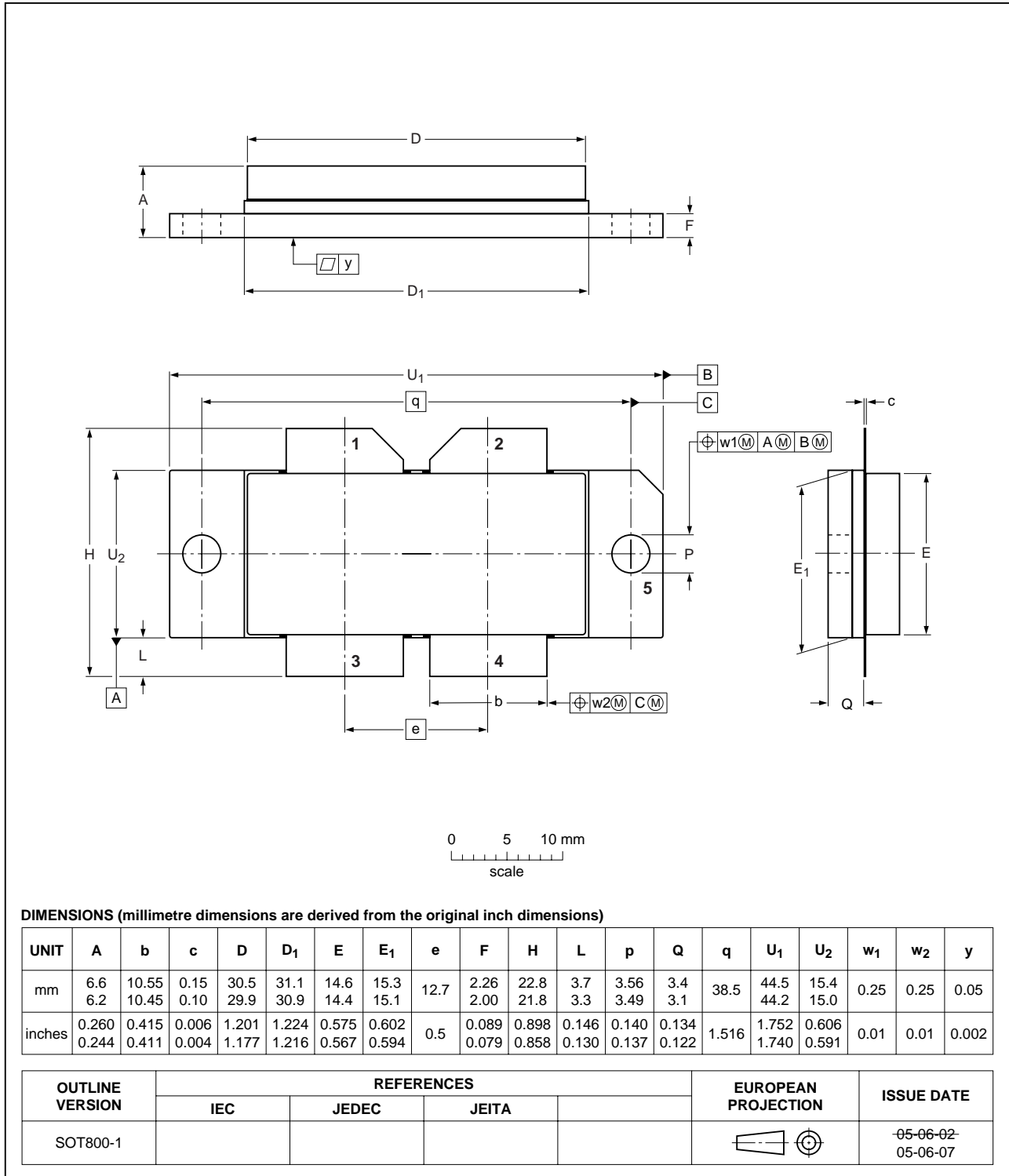


Fig 13. Package outline SOT800-1

10. Abbreviations

Table 9: Abbreviations

Acronym	Description
CDMA	Code Division Multiple Access
CW	Continuous Wave
DVB	Digital Video Broadcast
EDGE	Enhanced Data rates for GSM Evolution
ESR	Equivalent Series Resistance
EVM	Error Vector Magnitude
GSM	Global System for Mobile communications
IMD	InterModulation Distortion
LDMOS	Laterally Diffused Metal Oxide Semiconductor
OFDM	Orthogonal Frequency Division Multiplexing
PCB	Printed-Circuit Board
PEP	Peak Envelope Power
RF	Radio Frequency
SMD	Surface Mount Device
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	Doc. number	Supersedes
BLF872_1	20060220	Product data sheet	-	-	-

12. 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.
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