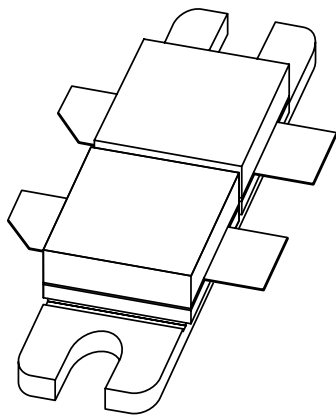


**DISCRETE SEMICONDUCTORS**

# DATA SHEET



## **BLF368** VHF push-pull power MOS transistor

Product specification  
Supersedes data of 1998 Jul 29

2003 Sep 26

## VHF push-pull power MOS transistor

BLF368

## FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

## DESCRIPTION

Dual push-pull silicon N-channel enhancement mode vertical D-MOS transistor, designed for broadcast transmitter applications in the VHF frequency range.

The transistor is encapsulated in a 4-lead SOT262A1 balanced flange package, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

## PIN CONFIGURATION

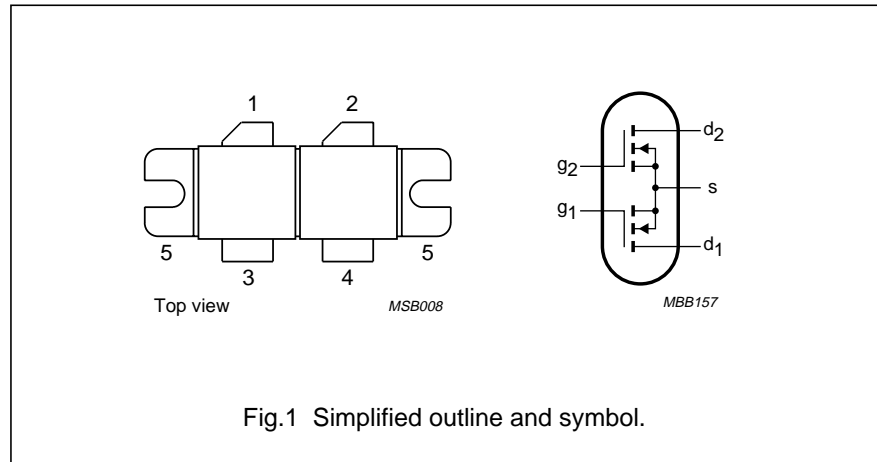


Fig.1 Simplified outline and symbol.

## 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.

## PINNING - SOT262A1

PIN	DESCRIPTION
1	drain 1
2	drain 2
3	gate 1
4	gate 2
5	source

## WARNING

## Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

## QUICK REFERENCE DATA

RF performance at  $T_h = 25^\circ\text{C}$  in a push-pull common source test circuit.

MODE OF OPERATION	f (MHz)	$V_{DS}$ (V)	$P_L$ (W)	$G_p$ (dB)	$\Delta G_p$ (dB) (note 1)	$\eta_D$ (%)
CW, class-AB	225	32	300	>12 typ. 13.5	>1 typ. 0.4	>55 typ. 62

## Note

1. Assuming a third order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% synchronized input/25% synchronized output compression in television service (negative modulation, CCIR system).

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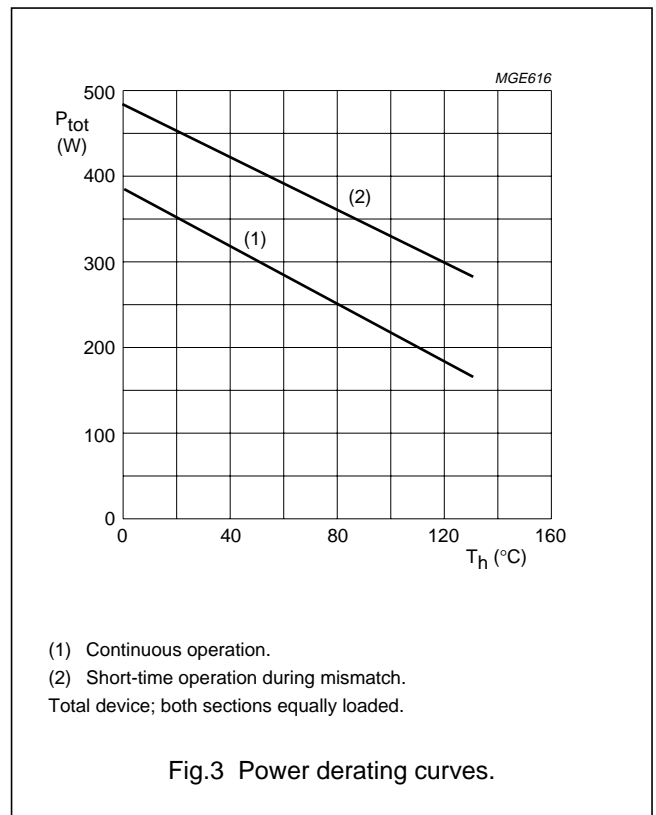
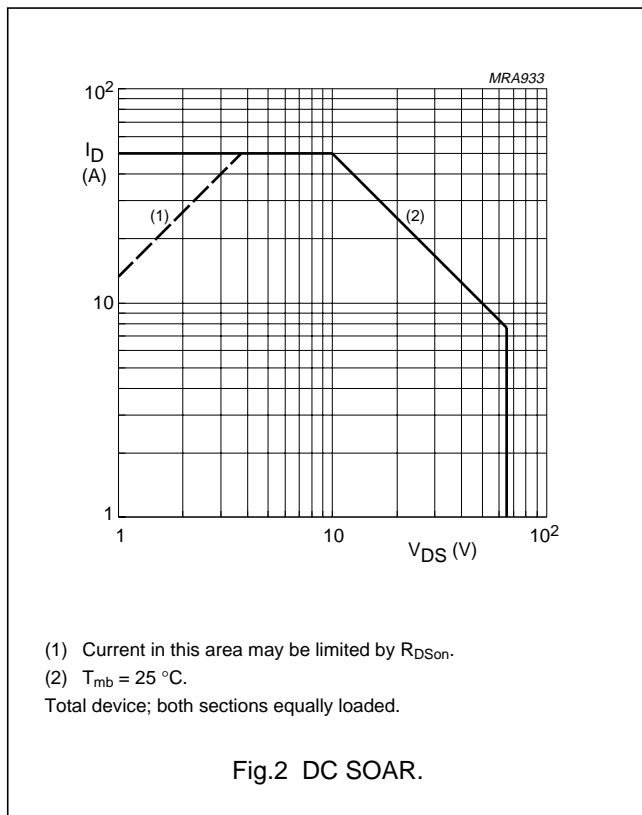
**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
<b>Per transistor section unless otherwise specified</b>					
$V_{DS}$	drain-source voltage		–	65	V
$V_{GS}$	gate-source voltage		–	$\pm 20$	V
$I_D$	drain current (DC)		–	25	A
$P_{tot}$	total power dissipation	$T_{mb} \leq 25\text{ }^\circ\text{C}$ total device; both sections equally loaded	–	500	W
$T_{stg}$	storage temperature		–65	+150	$^\circ\text{C}$
$T_j$	junction temperature		–	200	$^\circ\text{C}$

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded	0.35	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded	0.15	K/W



## VHF push-pull power MOS transistor

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## CHARACTERISTICS

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

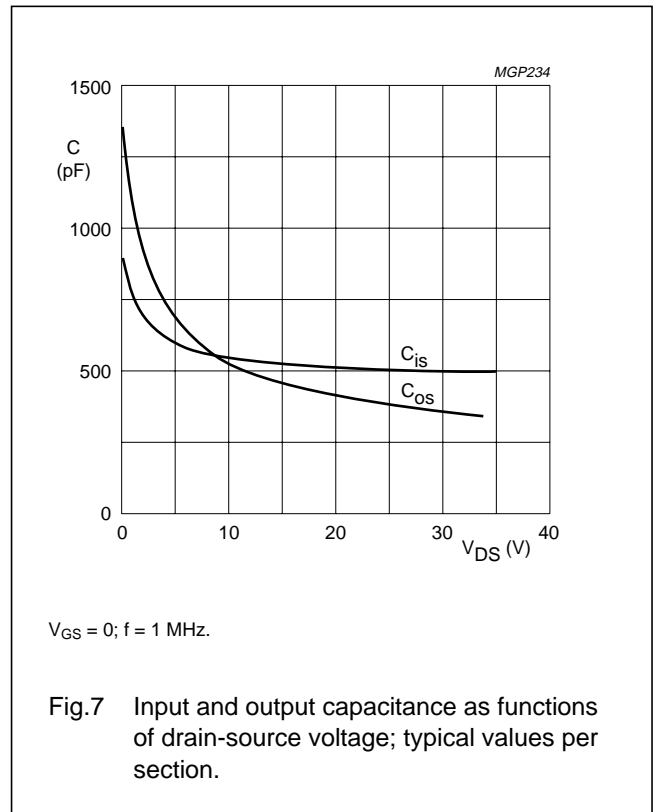
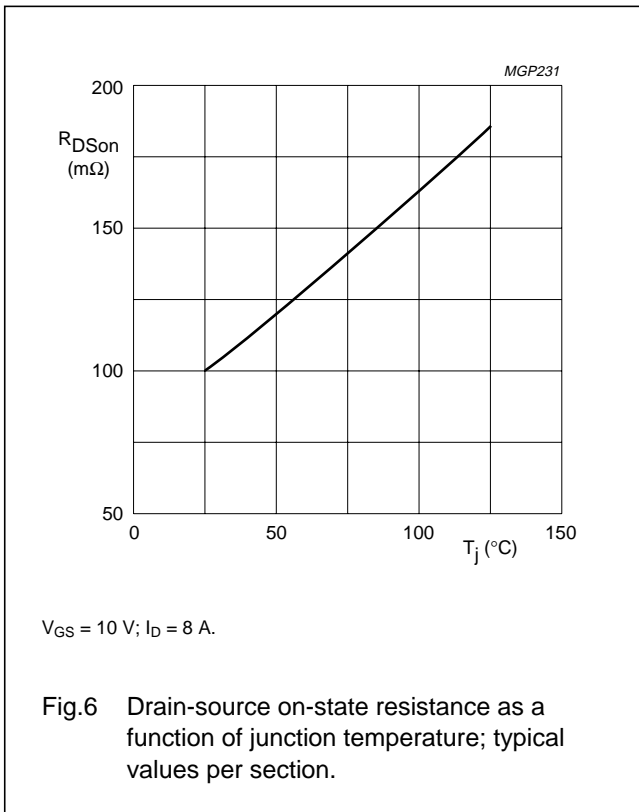
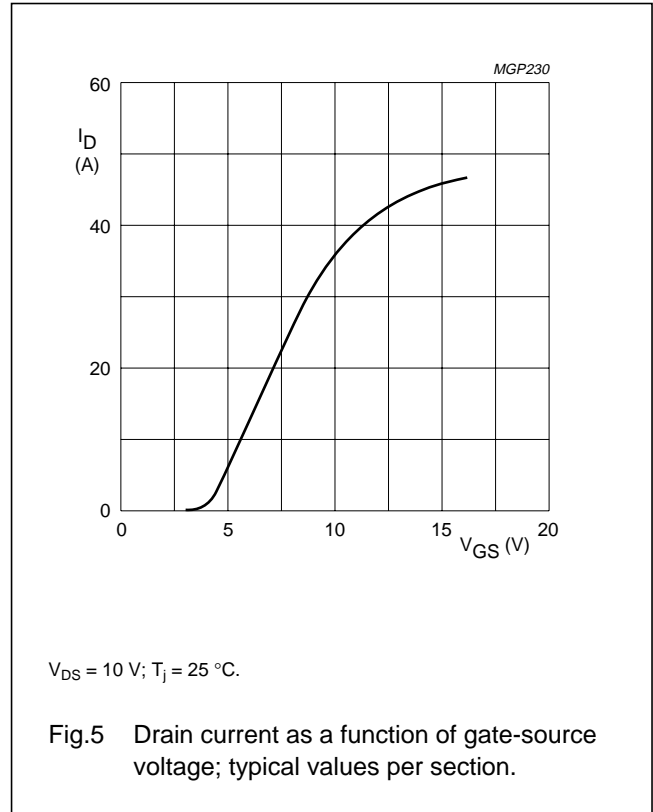
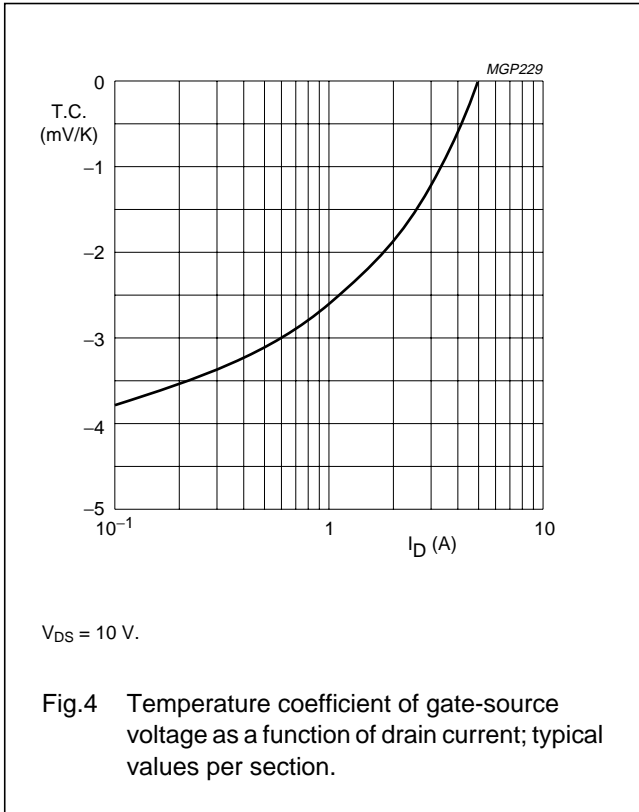
SYMBOL	PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Per transistor section</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0; I_D = 100\text{ mA}$	65	–	–	V
$I_{DSS}$	drain-source leakage current	$V_{GS} = 0; V_{DS} = 32\text{ V}$	–	–	5	mA
$I_{GSS}$	gate-source leakage current	$V_{GS} = \pm 20\text{ V}; V_{DS} = 0$	–	–	1	$\mu\text{A}$
$V_{GSth}$	gate-source threshold voltage	$I_D = 100\text{ mA}; V_{DS} = 10\text{ V}$	2	–	4.5	V
$\Delta V_{GS}$	gate-source voltage difference of both transistor sections	$I_D = 100\text{ mA}; V_{DS} = 10\text{ V}$	–	–	100	mV
$g_{fs}$	forward transconductance	$I_D = 8\text{ A}; V_{DS} = 10\text{ V}$	5	7.5	–	S
$g_{fs1}/g_{fs2}$	forward transconductance ratio of both transistor sections	$I_D = 8\text{ A}; V_{DS} = 10\text{ V}$	0.9	–	1.1	
$R_{DSon}$	drain-source on-state resistance	$I_D = 8\text{ A}; V_{DS} = 10\text{ V}$	–	0.1	0.15	$\Omega$
$I_{DSX}$	on-state drain current	$V_{GS} = 10\text{ V}; V_{DS} = 10\text{ V}$	–	37	–	A
$C_{is}$	input capacitance	$V_{GS} = 0; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	–	495	–	pF
$C_{os}$	output capacitance	$V_{GS} = 0; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	–	340	–	pF
$C_{rs}$	feedback capacitance	$V_{GS} = 0; V_{DS} = 32\text{ V}; f = 1\text{ MHz}$	–	40	–	pF
$C_{d-f}$	drain-flange capacitance		–	5.4	–	pF

 $V_{GS}$  group indicator

GROUP	LIMITS (V)		GROUP	LIMITS (V)	
	MIN.	MAX.		MIN.	MAX.
A	2.0	2.1	O	3.3	3.4
B	2.1	2.2	P	3.4	3.5
C	2.2	2.3	Q	3.5	3.6
D	2.3	2.4	R	3.6	3.7
E	2.4	2.5	S	3.7	3.8
F	2.5	2.6	T	3.8	3.9
G	2.6	2.7	U	3.9	4.0
H	2.7	2.8	V	4.0	4.1
J	2.8	2.9	W	4.1	4.2
K	2.9	3.0	X	4.2	4.3
L	3.0	3.1	Y	4.3	4.4
M	3.1	3.2	Z	4.4	4.5
N	3.2	3.3			

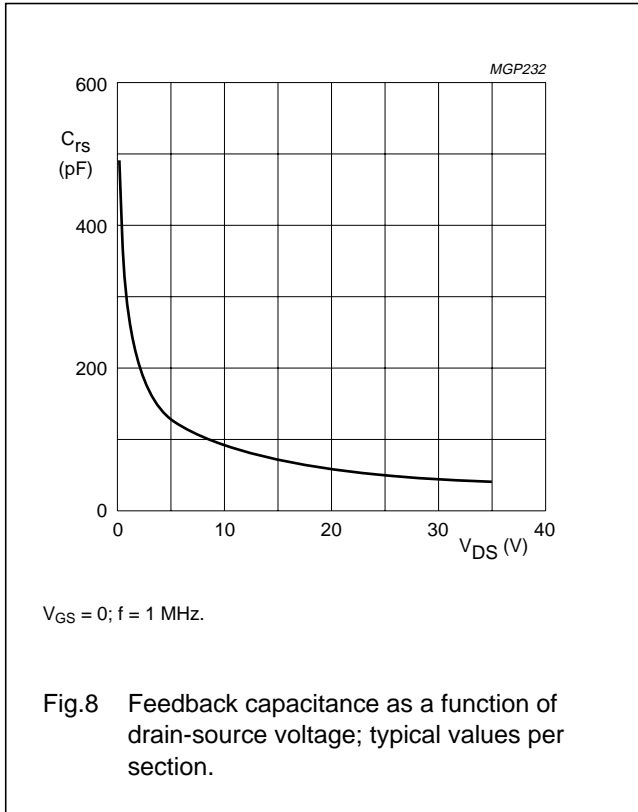
VHF push-pull power MOS transistor

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## VHF push-pull power MOS transistor

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**APPLICATION INFORMATION FOR CLASS-AB OPERATION**

$T_h = 25^\circ\text{C}$ ;  $R_{th\ mb-h} = 0.15 \text{ K/W}$  unless otherwise specified. RF performance in CW operation in a common source class-AB circuit.  $R_{GS} = 536 \ \Omega$  per section; optimum load impedance per section =  $1.34 + j0.34 \ \Omega$ ;  $V_{DS} = 32 \text{ V}$ .

MODE OF OPERATION	f (MHz)	$V_{DS}$ (V)	$I_{DQ}$ (mA)	$P_L$ (W)	$G_p$ (dB)	$\Delta G_p^{(1)}$ (dB)	$\eta_D$ (%)
CW, class-AB	225	32	$2 \times 250$	300	>12 typ. 13.5	>1 typ. 0.4	>55 typ. 62
	225	28	$2 \times 250$	300	typ. 13	typ. 0.7	typ. 68
	225	35	$2 \times 250$	300	typ. 14	typ. 0.2	typ. 60
	175	28	$2 \times 250$	300	typ. 15	typ. 0.5	typ. 70

**Note**

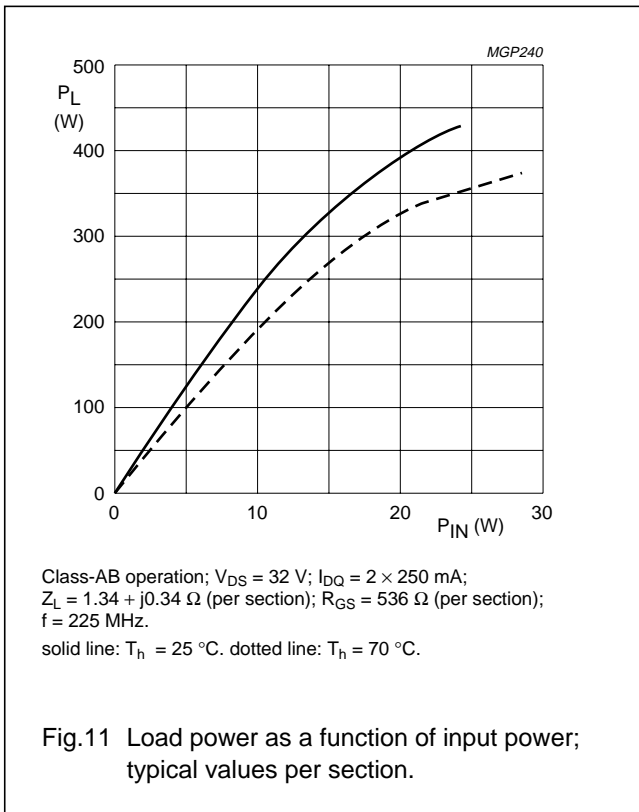
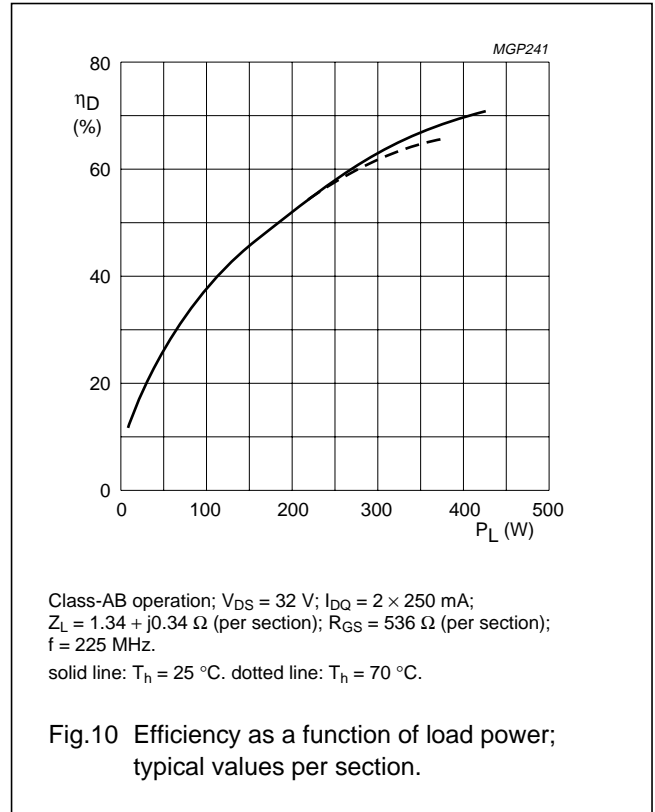
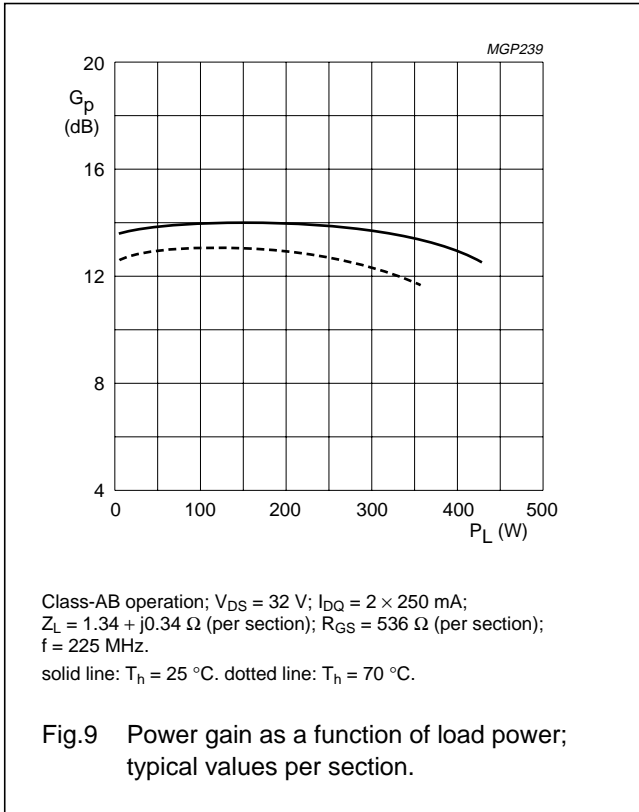
- Assuming a third order amplitude transfer characteristic, 1 dB compression corresponds with 30% synchronized input/25% synchronized output compression in television service (negative modulation, CCIR system).

**Ruggedness in class-AB operation**

The BLF368 is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 10:1$  through all phases under the following conditions:  $V_{DS} = 32 \text{ V}$ ;  $f = 225 \text{ MHz}$  at rated output power.

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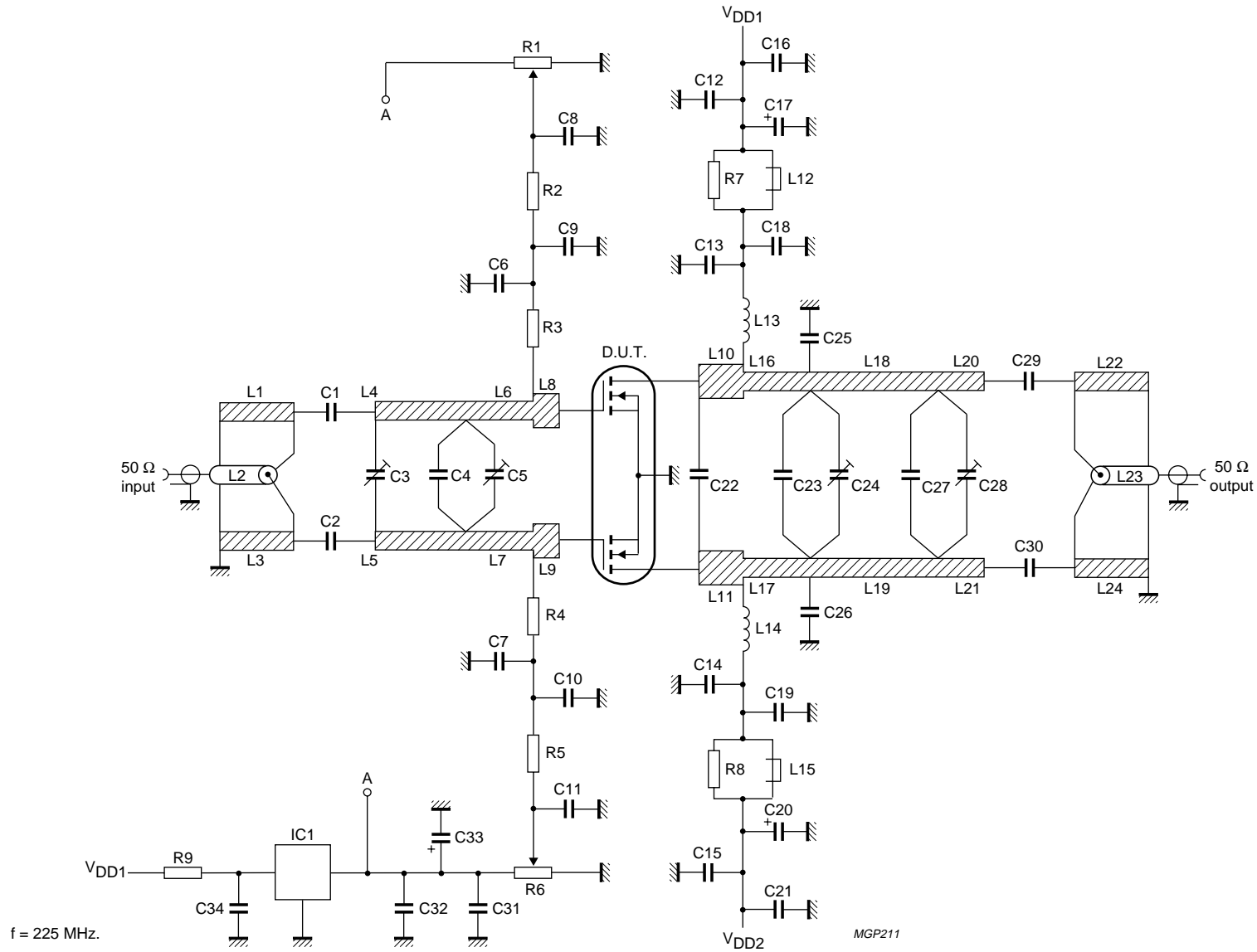


Fig.12 Test circuit for class-AB operation.

VHF push-pull power MOS transistor

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Philips Semiconductors

Product specification



## VHF push-pull power MOS transistor

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## List of components class-AB test circuit (see Figs 12 and 13)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor; note 1	2 × 56 pF in parallel + 18 pF, 500 V		
C3	film dielectric trimmer	2 to 9 pF		2222 809 09005
C4	multilayer ceramic chip capacitor; note 1	47 pF, 500 V		
C5	film dielectric trimmer	5 to 60 pF		2222 809 08003
C6, C7, C9, C10, C12, C15, C31, C34	multilayer ceramic chip capacitor; note 1	1 nF, 500 V		2222 852 47104
C8, C11, C16, C21, C32	multilayer ceramic chip capacitor; note 1	100 nF, 50 V		
C17, C20, C33	electrolytic capacitor	10 μF, 63 V		
C22	multilayer ceramic chip capacitor; note 1	82 pF, 500 V		
C23	multilayer ceramic chip capacitor; note 1	10 pF + 30 pF in parallel, 500 V		
C24, C28	film dielectric trimmer	2 to 18 pF		2222 809 09006
C25, C26	multilayer ceramic chip capacitor; note 1	39 pF + 47 pF in parallel, 500 V		
C27	multilayer ceramic chip capacitor; note 1	18 pF, 500 V		
C29, C30	multilayer ceramic chip capacitor; note 1	3 × 100 pF in parallel, 500 V		
L1, L3, L22, L24	stripline; note 2	50 Ω	4.8 × 80 mm	
L2, L23	semi-rigid cable; note 3	50 Ω	ext. conductor length 80 mm ext. dia 3.6 mm	
L4, L5	stripline; note 2	43 Ω	6 × 32.5 mm	
L6, L7	stripline; note 2	43 Ω	6 × 10.5 mm	
L8, L9	stripline; note 2	43 Ω	6 × 3 mm	
L10, L11	stripline; note 2	43 Ω	6 × 10.5 mm	
L12, L15	grade 3B Ferroxcube wideband HF choke	2 in parallel		4312 020 36642
L13, L14	2 turns enamelled 1.6 mm copper wire	25 nH	space 2.5 mm int. dia. 5 mm leads 2 × 7 mm	
L16, L17	stripline; notes 2 and 4	43 Ω	6 × 3 mm	
L18, L19	stripline; notes 2 and 4	43 Ω	6 × 35 mm	
L20, L21	stripline; notes 2 and 4	43 Ω	6 × 9 mm	
R1, R6	10 turns potentiometer	50 kΩ		
R2, R5	metal film resistor	0.4 W, 1 kΩ		
R3, R4	metal film resistor	0.4 W, 536 Ω		

## VHF push-pull power MOS transistor

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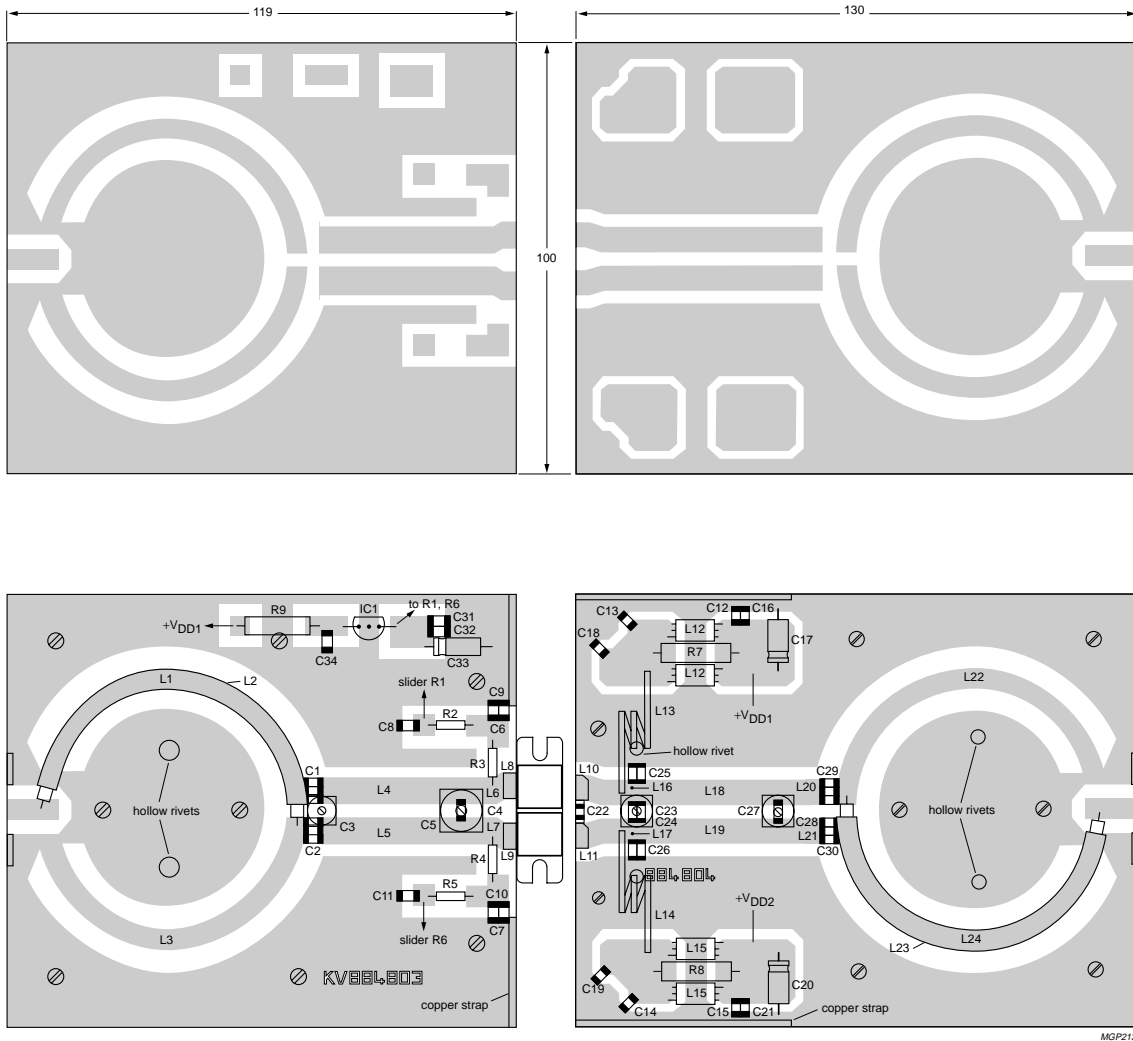
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
R7, R8	metal film resistor	1 W, $\pm 5\%$ , 10 $\Omega$		
R9	metal film resistor	1 W, 3.16 k $\Omega$		
IC1	voltage regulator 78L05			

**Notes**

1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. The striplines L1, L3 to L11, L16 to L22 and L24 are on a double copper-clad printed circuit board with glass microfibre PTFE dielectric ( $\epsilon_r = 2.2$ ); thickness  $\frac{1}{16}$  inch; thickness of copper sheet  $2 \times 35 \mu\text{m}$ .
3. Semi-rigid cables L2 and L23 are soldered on to striplines L1 and L24.
4. A copper strap, thickness 0.8 mm, is soldered over the complete striplines L16 to L21 to avoid overheating by large RF currents.

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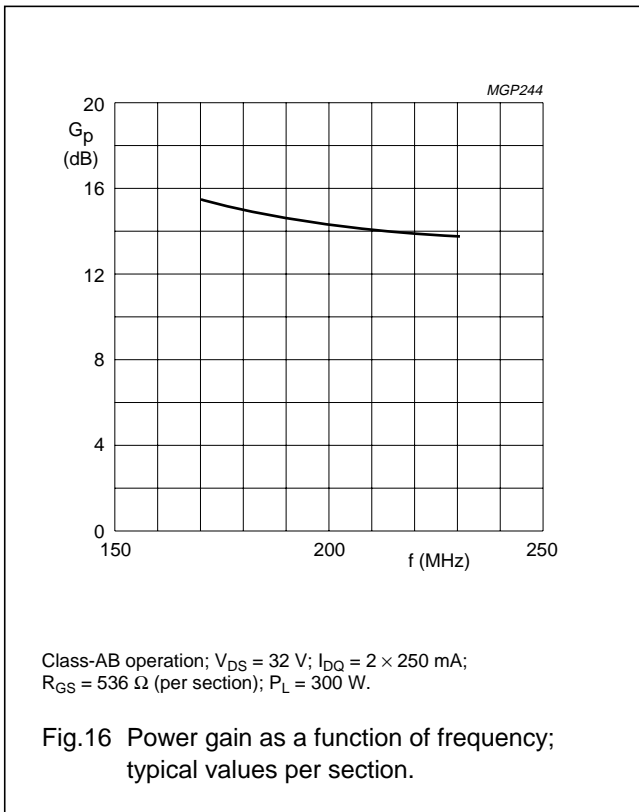
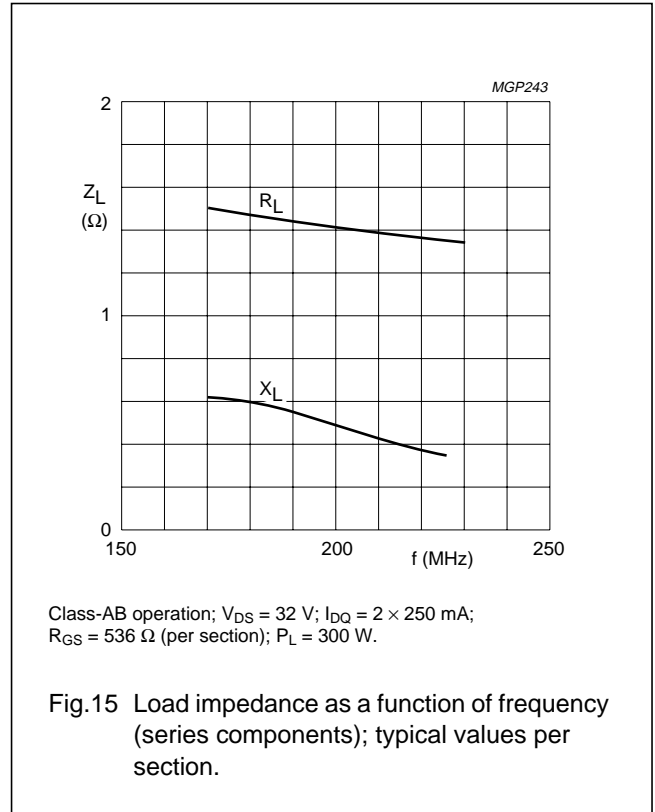
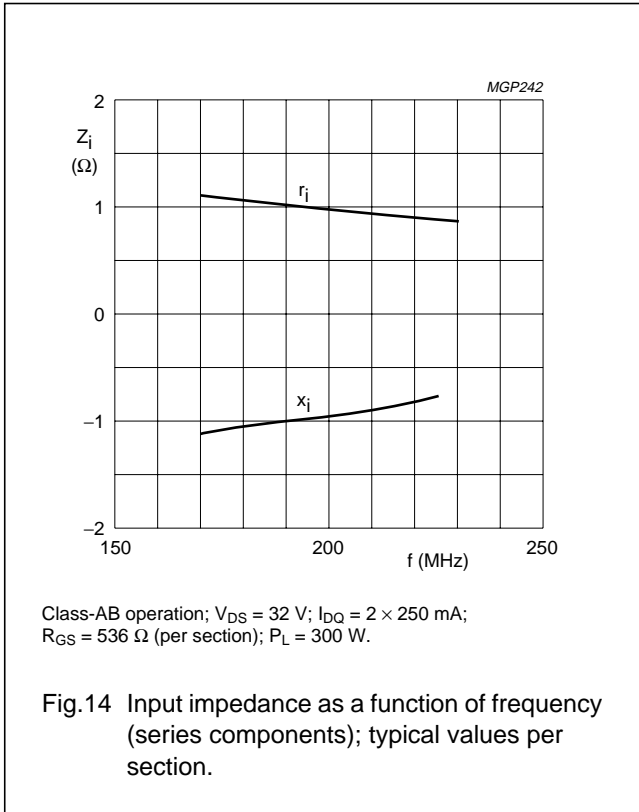


The circuit and components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets for a direct contact between upper and lower sheets. Dimensions in mm.

Fig.13 Component layout for 225 MHz class-AB test circuit.

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## VHF push-pull power MOS transistor

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## BLF368 scattering parameters

 $V_{DS} = 28\text{ V}$ ;  $I_D = 250\text{ mA}$ ; note 1

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	S <sub>11</sub>	∠Φ	S <sub>21</sub>	∠Φ	S <sub>12</sub>	∠Φ	S <sub>22</sub>	∠Φ
5	0.86	-159.2	21.94	96.8	0.01	-0.8	0.90	169.1
10	0.86	-168.9	11.14	88.5	0.01	21.1	0.85	174.3
20	0.86	-173.4	5.45	79.2	0.01	18.7	0.83	178.2
30	0.86	-174.2	3.53	72.3	0.02	8.7	0.83	-179.8
40	0.87	-174.4	2.54	66.3	0.02	0.3	0.84	-178.0
50	0.88	-174.5	1.94	61.0	0.02	-6.7	0.85	-176.7
60	0.90	-174.7	1.54	56.1	0.01	-12.5	0.86	-175.9
70	0.91	-174.9	1.25	51.8	0.01	-17.4	0.88	-175.4
80	0.92	-175.2	1.04	47.9	0.01	-21.1	0.89	-175.1
90	0.93	-175.5	0.88	44.4	0.01	-24.1	0.90	-175.0
100	0.93	-175.9	0.75	41.0	0.01	-26.6	0.91	-175.1
125	0.95	-176.7	0.53	34.0	0.01	-29.8	0.93	-175.6
150	0.96	-177.6	0.38	29.3	0.01	-28.2	0.94	-175.7
175	0.97	-178.4	0.30	25.8	0.00	-21.2	0.96	-176.1
200	0.97	-179.1	0.23	22.6	0.00	-6.2	0.97	-176.8
250	0.98	179.5	0.16	18.7	0.00	45.7	0.98	-177.7
300	0.99	178.4	0.11	17.1	0.01	70.9	0.99	-178.6
350	0.99	177.3	0.08	16.6	0.01	76.9	0.99	-179.2
400	0.99	176.4	0.07	18.9	0.01	84.9	0.99	-179.9
450	0.99	175.3	0.05	21.7	0.01	87.8	0.99	179.5
500	0.99	174.4	0.05	27.2	0.01	88.4	1.00	178.9
600	0.99	172.6	0.04	37.8	0.02	89.3	1.00	177.8
700	1.00	170.8	0.03	50.9	0.02	90.0	1.00	176.8
800	1.00	169.0	0.03	62.1	0.03	91.1	1.00	175.8
900	1.00	167.1	0.04	71.3	0.03	91.6	1.00	174.9
1000	1.00	165.1	0.04	76.4	0.04	92.3	1.00	173.8

## Note

- For more extensive s-parameters see internet:  
<http://www.semiconductors.philips.com/markets/communications/wirelesscommunications/broadcast>

## VHF push-pull power MOS transistor

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## BLF368 scattering parameters

 $V_{DS} = 32\text{ V}$ ;  $I_D = 250\text{ mA}$ ; note 1

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	S <sub>11</sub>	∠Φ	S <sub>21</sub>	∠Φ	S <sub>12</sub>	∠Φ	S <sub>22</sub>	∠Φ
5	0.86	-157.9	23.11	97.5	0.01	-2.1	0.90	168.6
10	0.86	-168.3	11.76	88.9	0.01	20.9	0.84	174.0
20	0.86	-173.1	5.75	79.4	0.01	18.7	0.82	178.1
30	0.86	-174.0	3.73	72.5	0.02	8.8	0.83	-179.7
40	0.87	-174.3	2.68	66.5	0.02	0.5	0.83	-177.9
50	0.88	-174.5	2.05	61.2	0.02	-6.5	0.84	-176.5
60	0.90	-174.6	1.63	56.4	0.01	-12.3	0.86	-175.7
70	0.91	-174.8	1.33	52.1	0.01	-17.1	0.87	-175.2
80	0.92	-175.2	1.10	48.2	0.01	-20.9	0.88	-174.8
90	0.93	-175.5	0.93	44.7	0.01	-23.9	0.89	-174.7
100	0.93	-175.8	0.80	41.4	0.01	-26.3	0.91	-174.8
125	0.95	-176.6	0.56	34.3	0.01	-29.5	0.92	-175.3
150	0.96	-177.5	0.41	29.5	0.01	-27.8	0.94	-175.5
175	0.97	-178.4	0.31	26.0	0.00	-20.8	0.96	-175.9
200	0.97	-179.1	0.25	22.8	0.00	-5.6	0.97	-176.6
250	0.98	179.6	0.16	18.9	0.00	45.9	0.98	-177.5
300	0.99	178.4	0.12	17.0	0.01	71.1	0.98	-178.4
350	0.99	177.3	0.09	16.9	0.01	77.4	0.99	-179.1
400	0.99	176.4	0.07	18.6	0.01	84.9	0.99	-179.8
450	0.99	175.4	0.06	21.2	0.01	87.9	0.99	179.7
500	0.99	174.4	0.05	24.8	0.01	88.5	1.00	179.0
600	0.99	172.6	0.04	36.3	0.02	89.4	1.00	177.9
700	1.00	170.8	0.03	49.2	0.02	90.1	1.00	176.9
800	1.00	169.0	0.03	61.2	0.03	91.2	1.00	175.9
900	1.00	167.1	0.04	70.4	0.03	91.8	1.00	175.0
1000	1.00	165.1	0.04	75.8	0.04	92.5	1.00	173.9

## Note

- For more extensive s-parameters see internet:  
<http://www.semiconductors.philips.com/markets/communications/wirelesscommunications/broadcast>

## VHF push-pull power MOS transistor

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## BLF368 scattering parameters

 $V_{DS} = 35 \text{ V}$ ;  $I_D = 250 \text{ mA}$ ; note 1

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	S <sub>11</sub>	∠Φ	S <sub>21</sub>	∠Φ	S <sub>12</sub>	∠Φ	S <sub>22</sub>	∠Φ
5	0.86	-156.9	23.97	98.1	0.01	-3.2	0.90	168.3
10	0.86	-167.8	12.21	89.2	0.01	20.7	0.84	173.8
20	0.86	-172.9	5.98	79.6	0.01	18.7	0.82	178.1
30	0.86	-173.9	3.88	72.7	0.01	8.9	0.82	-179.7
40	0.87	-174.2	2.79	66.7	0.02	0.6	0.82	-177.8
50	0.89	-174.4	2.13	61.4	0.02	-6.4	0.84	-176.4
60	0.90	-174.6	1.70	56.5	0.01	-12.2	0.85	-175.5
70	0.91	-174.8	1.38	52.2	0.01	-16.9	0.87	-175.0
80	0.92	-175.2	1.15	48.4	0.01	-20.8	0.88	-174.7
90	0.93	-175.5	0.97	44.9	0.01	-23.7	0.89	-174.5
100	0.93	-175.8	0.83	41.5	0.01	-26.0	0.90	-174.6
125	0.95	-176.6	0.58	34.5	0.01	-29.2	0.92	-175.1
150	0.96	-177.5	0.43	29.6	0.01	-27.6	0.94	-175.3
175	0.97	-178.3	0.33	26.1	0.00	-20.4	0.96	-175.7
200	0.97	-179.0	0.26	22.9	0.00	-5.1	0.96	-176.4
250	0.98	179.6	0.17	19.0	0.00	46.5	0.98	-177.3
300	0.99	178.4	0.12	16.9	0.01	71.2	0.98	-178.3
350	0.99	177.3	0.09	16.5	0.01	77.5	0.99	-179.0
400	0.99	176.4	0.07	18.1	0.01	84.9	0.99	-179.7
450	0.99	175.4	0.06	20.5	0.01	87.9	0.99	179.7
500	0.99	174.4	0.05	25.1	0.01	88.5	1.00	179.1
600	0.99	172.6	0.04	35.9	0.02	89.5	1.00	178.0
700	1.00	170.8	0.03	48.8	0.02	90.1	1.00	176.9
800	1.00	169.0	0.04	59.9	0.03	91.2	1.00	176.0
900	1.00	167.1	0.04	69.8	0.03	91.9	1.00	175.0
1000	1.00	165.1	0.04	75.8	0.04	92.6	1.00	173.9

## Note

- For more extensive s-parameters see internet:  
<http://www.semiconductors.philips.com/markets/communications/wirelesscommunications/broadcast>

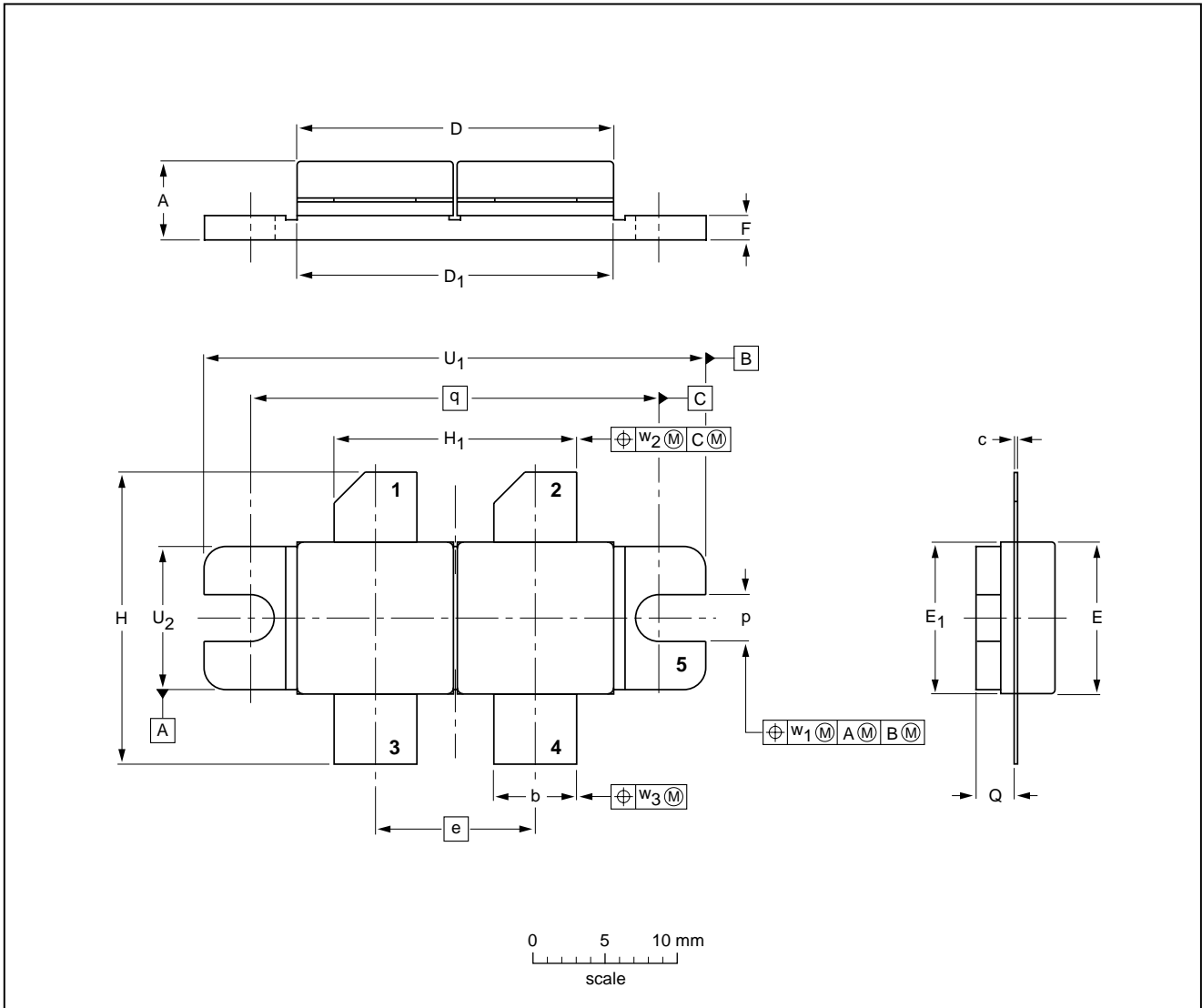
VHF push-pull power MOS transistor

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PACKAGE OUTLINE

Flanged double-ended ceramic package; 2 mounting holes; 4 leads

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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	5.85 5.58	0.16 0.10	22.17 21.46	21.98 21.71	11.05	10.27 10.05	10.29 10.03	1.78 1.52	21.08 19.56	17.02 16.51	3.28 3.02	2.85 2.59	27.94	34.17 33.90	9.91 9.65	0.25	0.51	0.25
inches	0.227 0.197	0.230 0.220	0.006 0.004	0.873 0.845	0.865 0.855	0.435	0.404 0.396	0.405 0.396	0.070 0.060	0.830 0.770	0.670 0.650	0.129 0.119	0.112 0.102	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			
SOT262A1						99-03-29



## VHF push-pull power MOS transistor

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## DATA SHEET STATUS

LEVEL	DATA SHEET STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)(3)</sup>	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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## **Contact information**

For additional information please visit <http://www.semiconductors.philips.com>. Fax: **+31 40 27 24825**

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Printed in The Netherlands

613524/04/pp18

Date of release: 2003 Sep 26

Document order number: 9397 750 11602

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