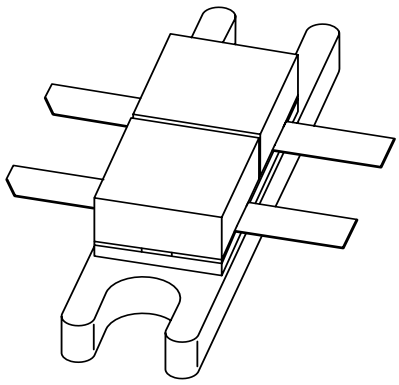
DATA SHEET



BLF546
UHF push-pull power MOS transistor

Product specification
Supersedes data of 1998 Jan 09

2003 Sep 22

Philips
Semiconductors

PHILIPS

UHF push-pull power MOS transistor BLF546

FEATURES

- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability
- Designed for broadband operation.

DESCRIPTION

Silicon N-channel enhancement mode vertical D-MOS push-pull transistor designed for communications transmitter applications in the UHF frequency range.

The transistor is encapsulated in a 4-lead, SOT268A balanced flange package, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

PIN CONFIGURATION

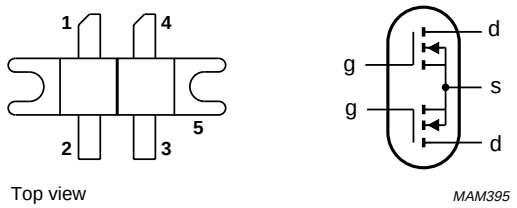


Fig.1 Simplified outline and symbol.

PINNING - SOT268A

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

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.

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 °C in a push-pull common source test circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	500	28	80	>11	>50

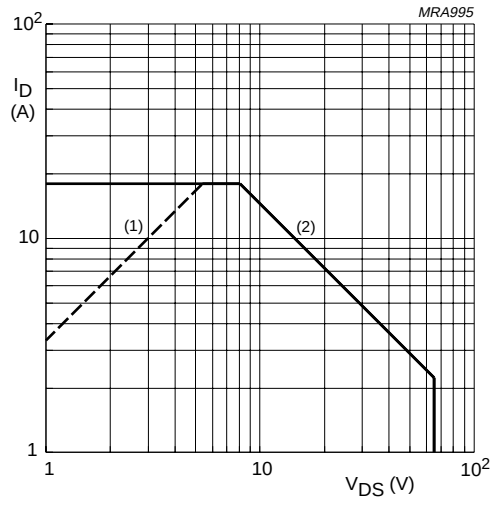
LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Per transistor section (unless otherwise specified)					
V_{DS}	drain-source voltage		–	65	V
V_{GS}	gate-source voltage		–	±20	V
I_D	drain current (DC)		–	9	A
P_{tot}	total power dissipation	$T_{mb} \leq 25$ °C; total device; both sections equally loaded	–	145	W
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	200	°C

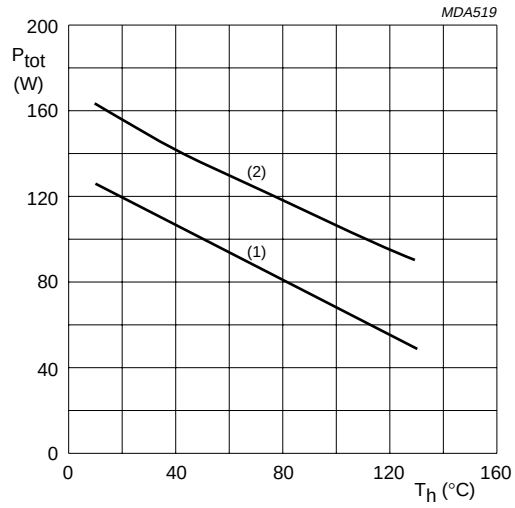
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	total device; both sections equally loaded	1.2	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink	total device; both sections equally loaded	0.25	K/W



(1) Current in this area may be limited by R_{DSon}.
(2) T_{mb} = 25 °C.
Total device; both sections equally loaded.

Fig.2 DC SOAR.



(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power derating curves.

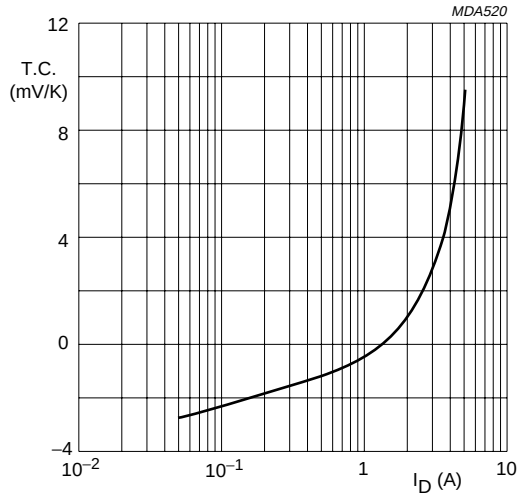
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Per section						
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 20 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	2	mA
I_{GSS}	gate-source leakage current	V_{GS} = ±20 V; V_{DS} = 0	–	–	1	μA
V_{GSth}	gate-source threshold voltage	I_D = 80 mA; V_{DS} = 10 V	1	–	4	V
g_{fs}	forward transconductance	I_D = 2.4 A; V_{DS} = 10 V	1.2	1.7	–	S
R_{DSon}	drain-source on-state resistance	I_D = 2.4 A; V_{GS} = 10 V	–	0.4	0.6	Ω
I_{DSX}	on-state drain current	V_{GS} = 15 V; V_{DS} = 10 V	–	10	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	60	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	46	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	15	–	pF

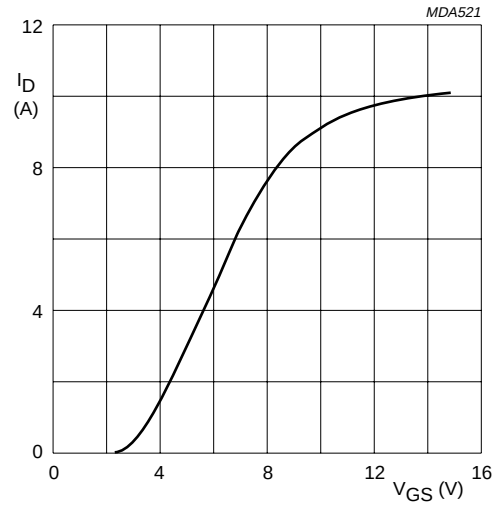
V_{GS} group indicator

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			



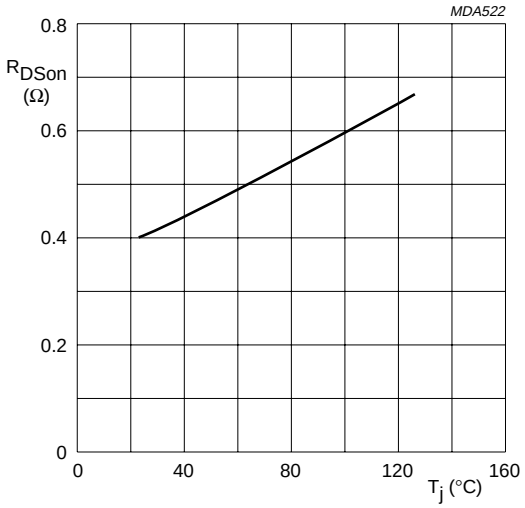
V_{DS} = 10 V.

Fig.4 Temperature coefficient of gate-source voltage as a function of drain current; typical values per section.



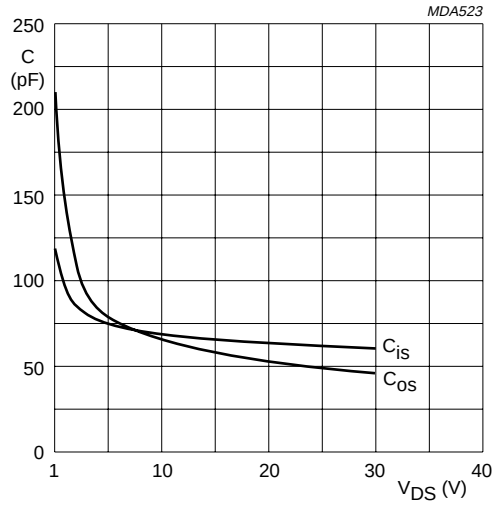
V_{DS} = 10 V; T_j = 25 °C.

Fig.5 Drain current as a function of gate-source voltage; typical values per section.



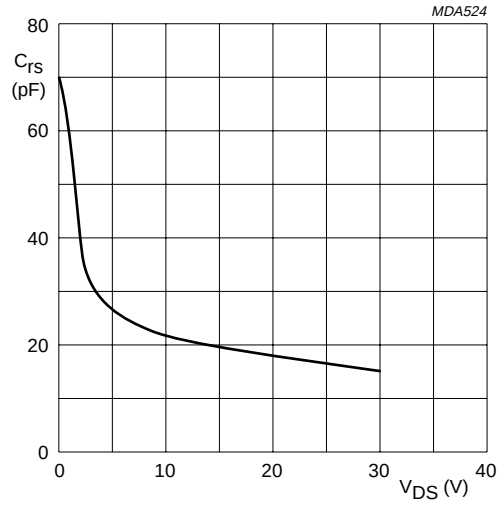
I_D = 2.4 A; V_{GS} = 10 V.

Fig.6 Drain-source on-state resistance as a function of junction temperature; typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.7 Input and output capacitance as functions of drain-source voltage; typical values per section.



V_{GS} = 0; f = 1 MHz.

Fig.8 Feedback capacitance as a function of drain-source voltage; typical values per section.

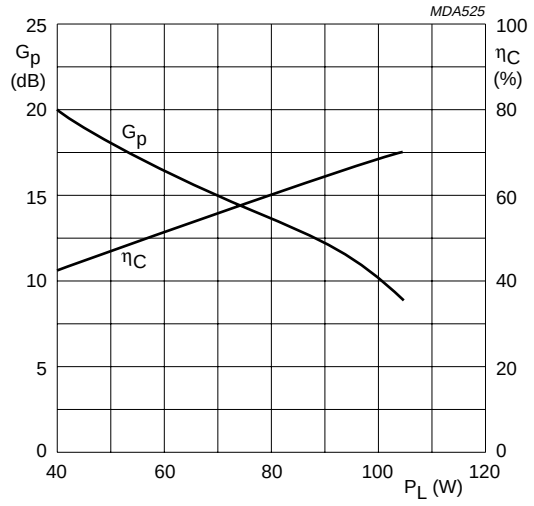
APPLICATION INFORMATION FOR CLASS-B OPERATION

T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.25 K/W, unless otherwise specified.
RF performance in a common source, class-B, push-pull circuit.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	I_{DQ} (mA)	P_L (W)	G_p (dB)	η_D (%)
CW, class-B	500	28	2×80	80	>11 typ. 13	>50 typ. 60

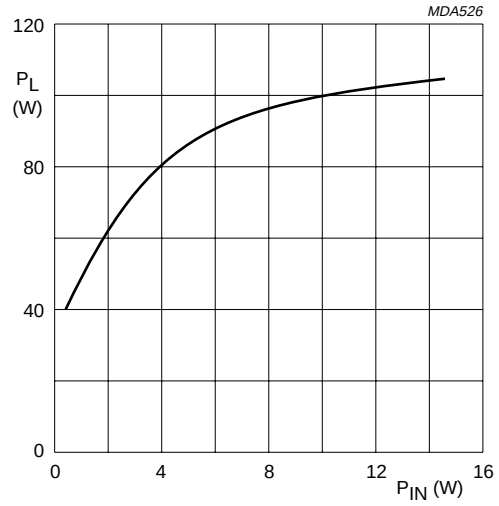
Ruggedness in class-B operation

The BLF546 is capable of withstanding a full load mismatch corresponding to VSWR = 10 through all phases under the following conditions: V_{DS} = 28 V; f = 500 MHz at rated output power.



Class-B operation; V_{DS} = 28 V; $I_{DQ} = 2 \times 80$ mA;
$Z_L = 2.3 + j2.7\ \Omega$(per section); f = 500 MHz.

Fig.9 Power gain and efficiency as functions of load power; typical values.



Class-B operation; V_{DS} = 28 V; $I_{DQ} = 2 \times 80$ mA;
$Z_L = 2.3 + j2.7\ \Omega$(per section); f = 500 MHz.

Fig.10 Load power as a function of input power; typical values.

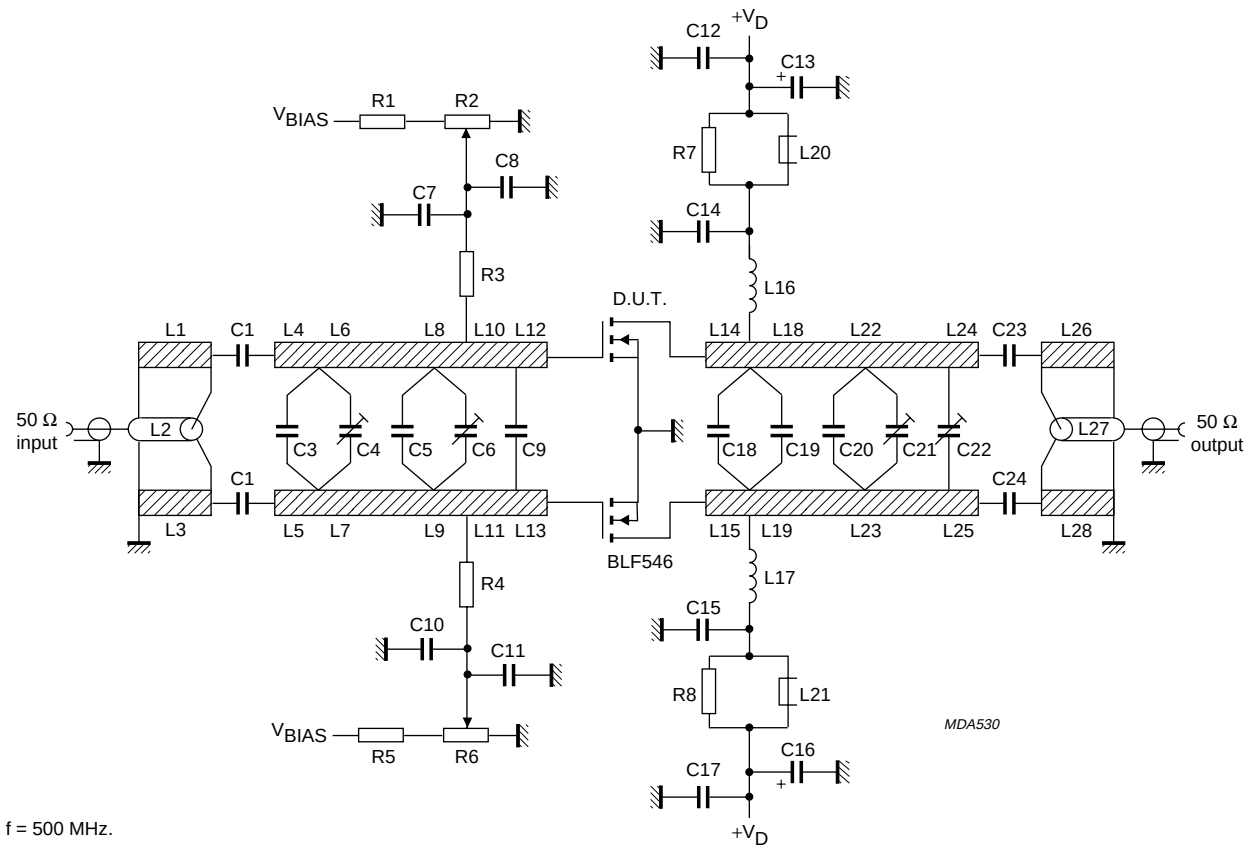


Fig.11 Test circuit for class-B operation.

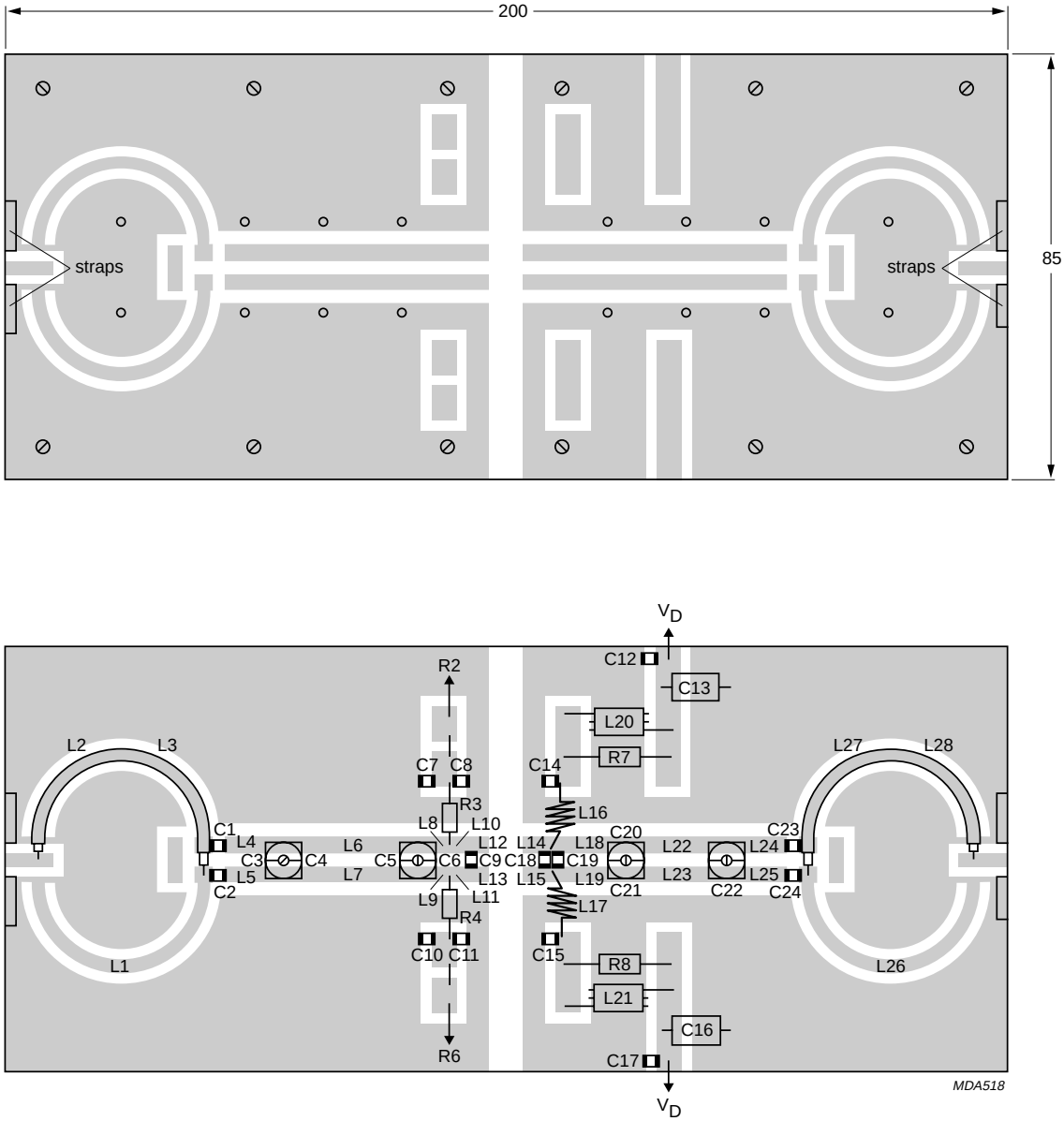
List of components (see Fig.11**)**

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor; note 1	33 pF, 500 V		
C3	multilayer ceramic chip capacitor; note 1	11 pF, 500 V		
C4, C6, C21, C22	film dielectric trimmer	2 to 9 pF		2222 809 09005
C5	multilayer ceramic chip capacitor; note 2	12 pF, 500 V		
C7, C10, C14, C15	multilayer ceramic chip capacitor; note 1	390 pF, 500 V		
C8, C11, C12, C17	multilayer ceramic chip capacitor	100 nF, 50 V		2222 852 47104
C9	multilayer ceramic chip capacitor; note 2	39 pF, 500 V		
C13, C16	electrolytic capacitor	4.7 μF, 63 V		2222 030 38478

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C18, C19	multilayer ceramic chip capacitor; note 2	18 pF, 500 V		
C20	multilayer ceramic chip capacitor; note 2	15 pF, 500 V		
C23, C24	multilayer ceramic chip capacitor; note 1	15 pF, 500 V		
L1, L3, L26, L28	stripline; note 3	50 Ω	55.6 × 2.4 mm	
L2	semi-rigid cable; note 4	50 Ω	ext. dia. 2 mm ext. conductor length 55.6 mm	
L4, L5	stripline; note 3	42 Ω	12 × 3 mm	
L6, L7	stripline; note 3	42 Ω	26.5 × 3 mm	
L8, L9	stripline; note 3	42 Ω	5.5 × 3 mm	
L10, L11	stripline; note 3	42 Ω	6 × 3 mm	
L12, L13	stripline; note 3	42 Ω	3 × 3 mm	
L14, L15	stripline; note 3	42 Ω	7 × 3 mm	
L16, L17	3 turns enamelled 1 mm copper wire	15.6 nH	length 8.5 mm int. dia. 5.4 mm leads 2 × 5 mm	
L18, L19	stripline; note 3	42 Ω	12 × 3 mm	
L20, L21	grade 3B Ferroxcube RF choke			4312 020 36642
L22, L23	stripline; note 3	42 Ω	20 × 3 mm	
L24, L25	stripline; note 3	42 Ω	14 × 3 mm	
L27	semi-rigid cable; note 5	50 Ω	ext. dia. 2 mm ext. conductor length 55.6 mm	
R1, R5	0.4 W metal film resistor	11.5 kΩ		2322 151 71153
R2, R6	10 turns cermet potentiometer	50 kΩ		
R3, R4	0.4 W metal film resistor	10 kΩ		2322 151 71003
R7, R8	1 W metal film resistor	10 Ω		2322 153 51009

Notes

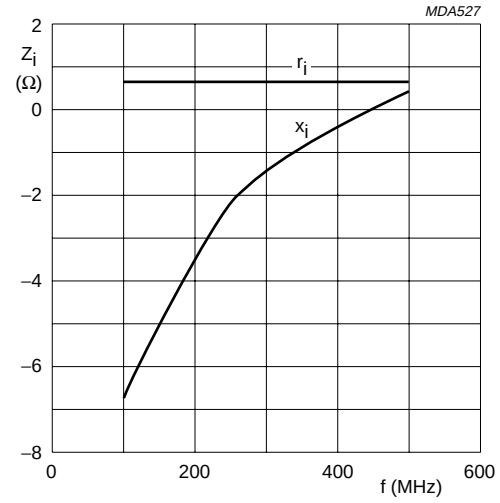
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. American Technical Ceramics (ATC) capacitor, type 175B or other capacitor of the same quality.
3. The striplines are on a double copper-clad printed circuit board, with glass microfibre reinforced PTFE (ε_r = 2.2); thickness $^1/_{32}$ inch.
4. Semi-rigid cable L2 is soldered on to stripline L3.
5. Semi-rigid cable L27 is soldered on to stripline L28.



Dimensions in mm.

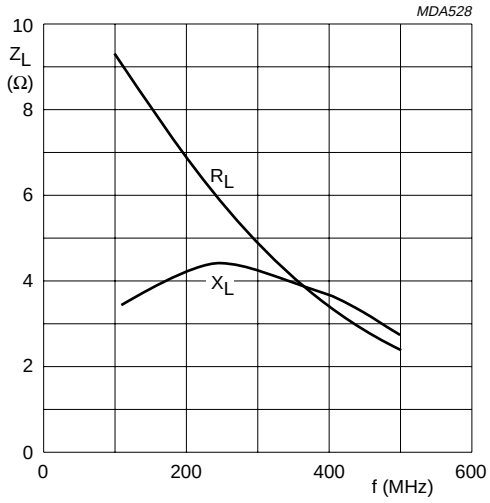
The circuit and components are situated on one side of the printed circuit board, the other side being fully metallized, to serve as a ground plane. Earth connections are made by means of copper straps and hollow rivets for a direct contact between upper and lower sheets.

Fig.12 Component layout for 500 MHz test circuit.



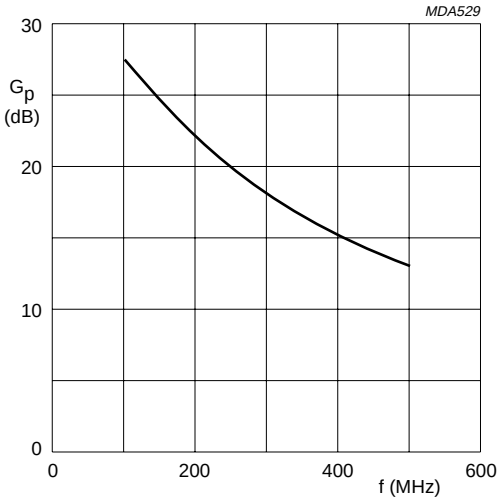
Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 × 80 mA; P_L = 80 W.

Fig.13 Input impedance as a function of frequency (series components); typical values per section.



Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 × 80 mA; P_L = 80 W.

Fig.14 Load impedance as a function of frequency (series components); typical values per section.

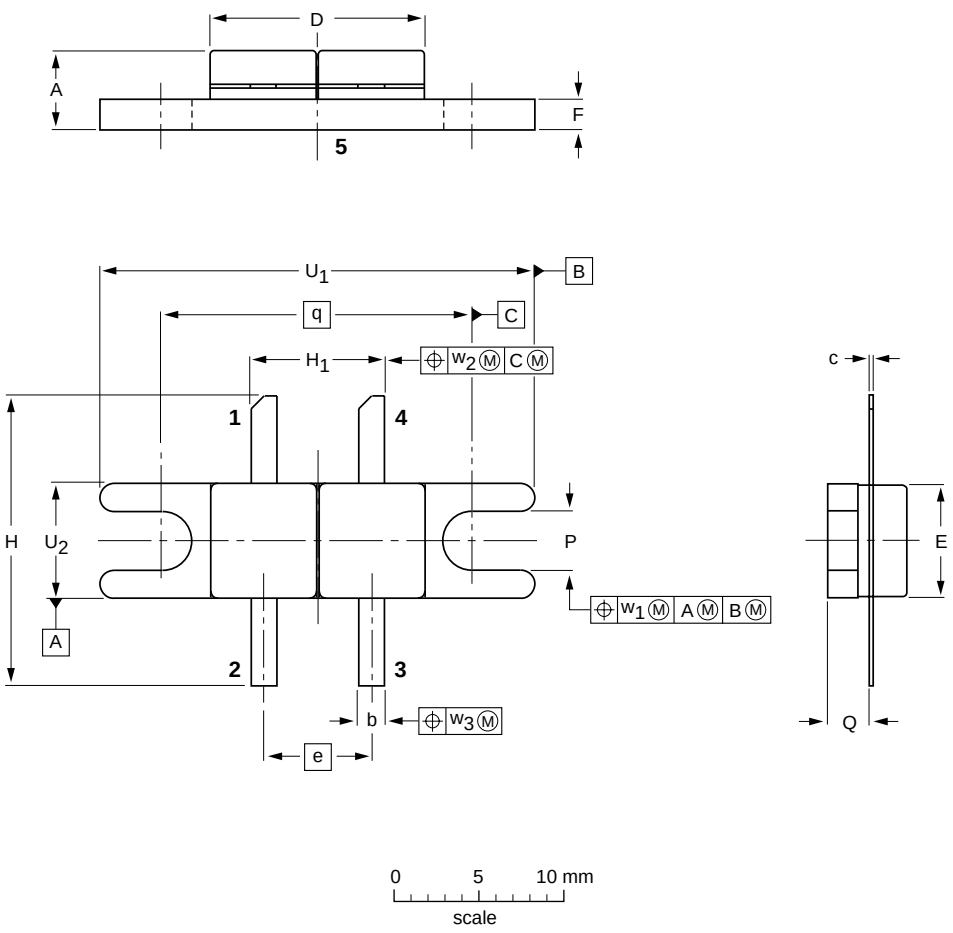


Class-B operation; V_{DS} = 28 V; I_{DQ} = 2 × 80 mA; P_L = 80 W.

Fig.15 Power gain as a function of frequency; typical values per section.

PACKAGE OUTLINE

Flanged double-ended ceramic package; 2 mounting holes; 4 leads **SOT268A**



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

UNIT	A	b	c	D	E	e	F	H	H_1	p	Q	q	U_1	U_2	w_1	w_2	w_3
mm	4.91 4.19	1.66 1.39	0.13 0.07	12.96 12.44	6.48 6.22	6.45	2.04 1.77	17.02 16.00	8.23 7.72	3.43 3.17	2.67 2.41	18.42	24.90 24.63	6.61 6.35	0.25	0.51	0.25
inches	0.193 0.165	0.065 0.055	0.005 0.003	0.510 0.490	0.255 0.245	0.254	0.080 0.070	0.670 0.630	0.324 0.304	0.135 0.125	0.105 0.095	0.725	0.980 0.970	0.260 0.250	0.010	0.020	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT268A						99-03-29

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS[1]	PRODUCT STATUS[2][3]	DEFINITION
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Printed in The Netherlands 613524/03/pp14 Date of release: 2003 Sep 22 Document order number: 9397 750 11591

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