DATA SHEET

BLF248
VHF push-pull power MOS transistor

Product specification

September 1992

Philips
Semiconductors

PHILIPS

VHF push-pull power MOS transistor BLF248

FEATURES

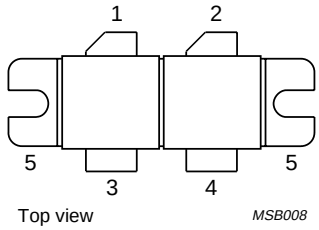
- High power gain
- Easy power control
- Good thermal stability
- Gold metallization ensures excellent reliability.

DESCRIPTION

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

The transistor is encapsulated in a 4-lead SOT262 A1 balanced flange envelope, with two ceramic caps. The mounting flange provides the common source connection for the transistors.

PIN CONFIGURATION



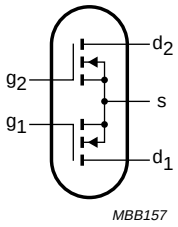


Fig.1 Simplified outline and symbol.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static charge during transport and handling.

PINNING - SOT262 A1

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 °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 (%)
class-AB	225	28	300	> 10	> 55
	175	28	300	typ. 13	typ. 67

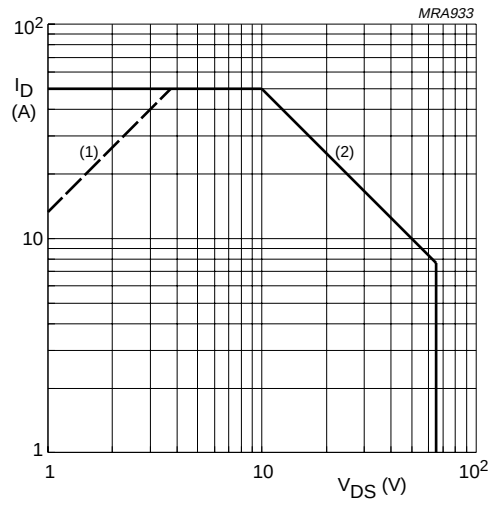
LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).
Per transistor section unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	65	V
$\pm V_{GS}$	gate-source voltage		–	20	V
I_D	DC drain current		–	25	A
P_{tot}	total power dissipation	up to T_{mb} = 25 °C total device; both sections equally loaded	–	500	W
T_{stg}	storage temperature		–65	150	°C

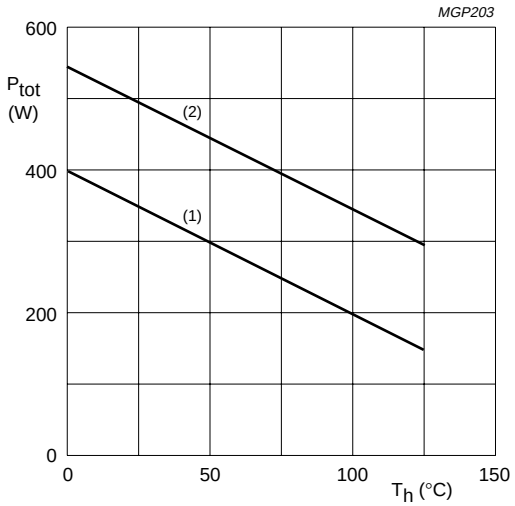
THERMAL RESISTANCE

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



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

Fig.2 DC SOAR.



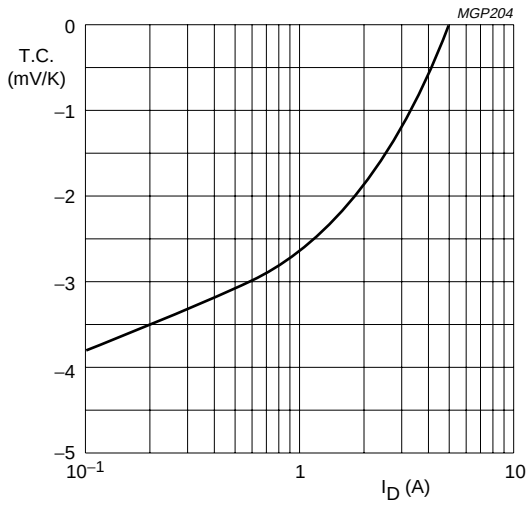
(1) Continuous operation.
(2) Short-time operation during mismatch.
Total device; both sections equally loaded.

Fig.3 Power/temperature derating curves.

CHARACTERISTICS (per section)

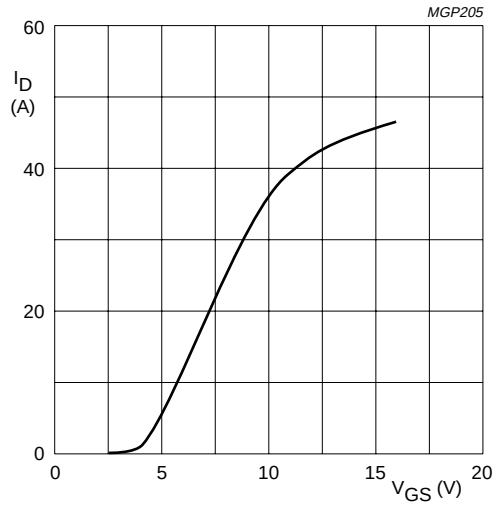
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0; I_D = 100 mA	65	–	–	V
I_{DSS}	drain-source leakage current	V_{GS} = 0; V_{DS} = 28 V	–	–	5	mA
I_{GSS}	gate-source leakage current	±V_{GS} = 20 V; V_{DS} = 0	–	–	1	µA
$V_{GS(th)}$	gate-source threshold voltage	I_D = 100 mA; V_{DS} = 10 V	2	–	4.5	V
ΔV_{GS}	gate-source voltage difference of both transistor sections	I_D = 100 mA; V_{DS} = 10 V	–	–	100	mV
g_{fs}	forward transconductance	I_D = 8 A; V_{DS} = 10 V	5	7.5	–	S
g_{fs1}/g_{fs2}	forward transconductance ratio of both transistor sections	I_D = 8 A; V_{DS} = 10 V	0.9	–	1.1	
$R_{DS(on)}$	drain-source on-state resistance	I_D = 8 A; V_{GS} = 10 V	–	0.1	0.15	Ω
I_{DSX}	on-state drain current	V_{GS} = 10 V; V_{DS} = 10 V	–	37	–	A
C_{is}	input capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	500	–	pF
C_{os}	output capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	360	–	pF
C_{rs}	feedback capacitance	V_{GS} = 0; V_{DS} = 28 V; f = 1 MHz	–	46	–	pF



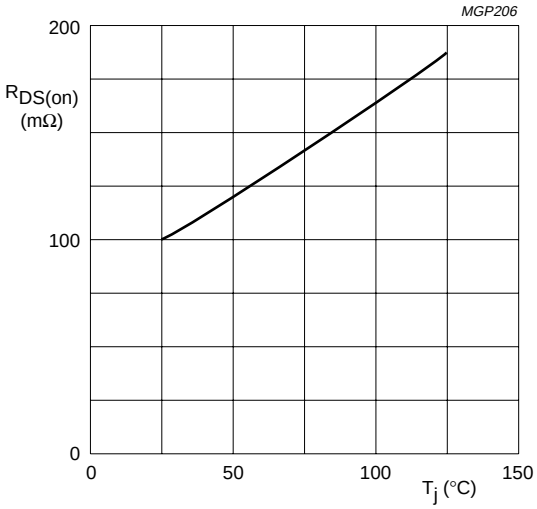
V_{DS} = 10 V.

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



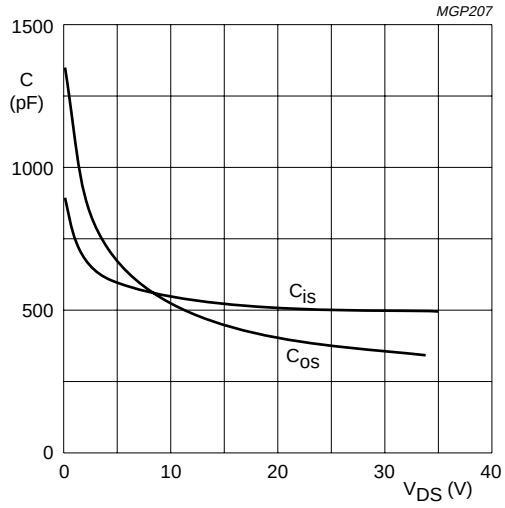
V_{DS} = 10 V; T_j = 25 °C.

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



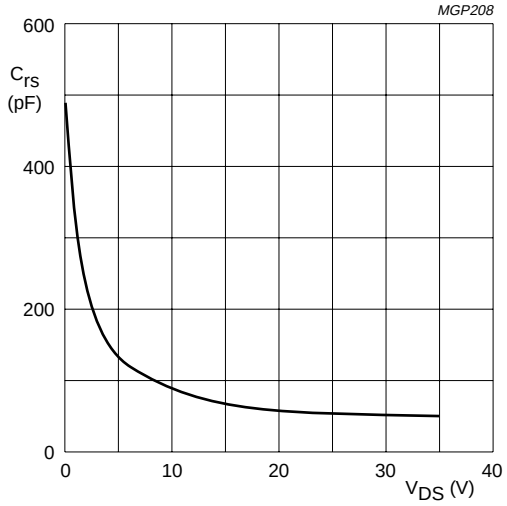
I_D = 8 A; V_{GS} = 10 V.

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-AB OPERATION

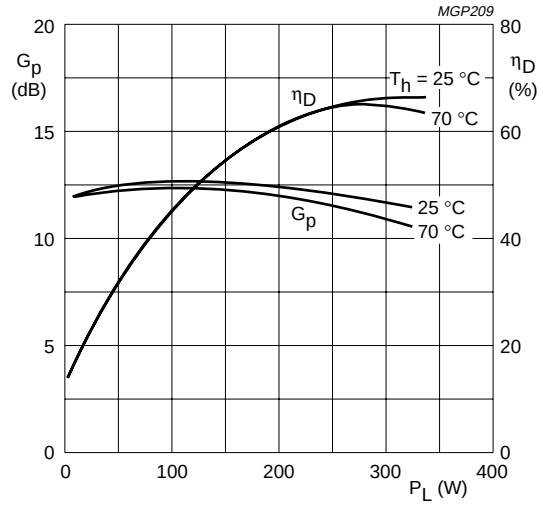
T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0.15 K/W, unless otherwise specified.
RF performance in a linear amplifier in a common source class-AB circuit.
R_{GS} = 536 Ω per section; optimum load impedance per section = 0.79 – j0.11 Ω.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_P (dB)	η_D (%)
class-AB	225	28	300	> 10 typ. 11.5	> 55 typ. 65
	175	28	300	typ. 13	typ. 67

Ruggedness in class-AB operation

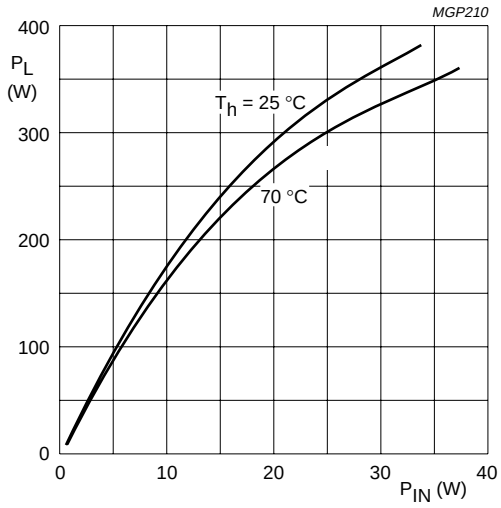
The BLF248 is capable of withstanding a load mismatch corresponding to VSWR = 50 through all phases under the following conditions:

V_{DS} = 28 V; f = 225 MHz at rated output power.



Class-AB operation; V_{DS} = 28 V; I_{DQ} = 2 × 250 mA; R_{GS} = 536 Ω (per section); Z_L = 0.79 – j0.11 Ω (per section); f = 225 MHz.

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



Class-AB operation; V_{DS} = 28 V; I_{DQ} = 2 × 250 mA; R_{GS} = 536 Ω (per section); Z_L = 0.79 – j0.11 Ω (per section); f = 225 MHz.

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

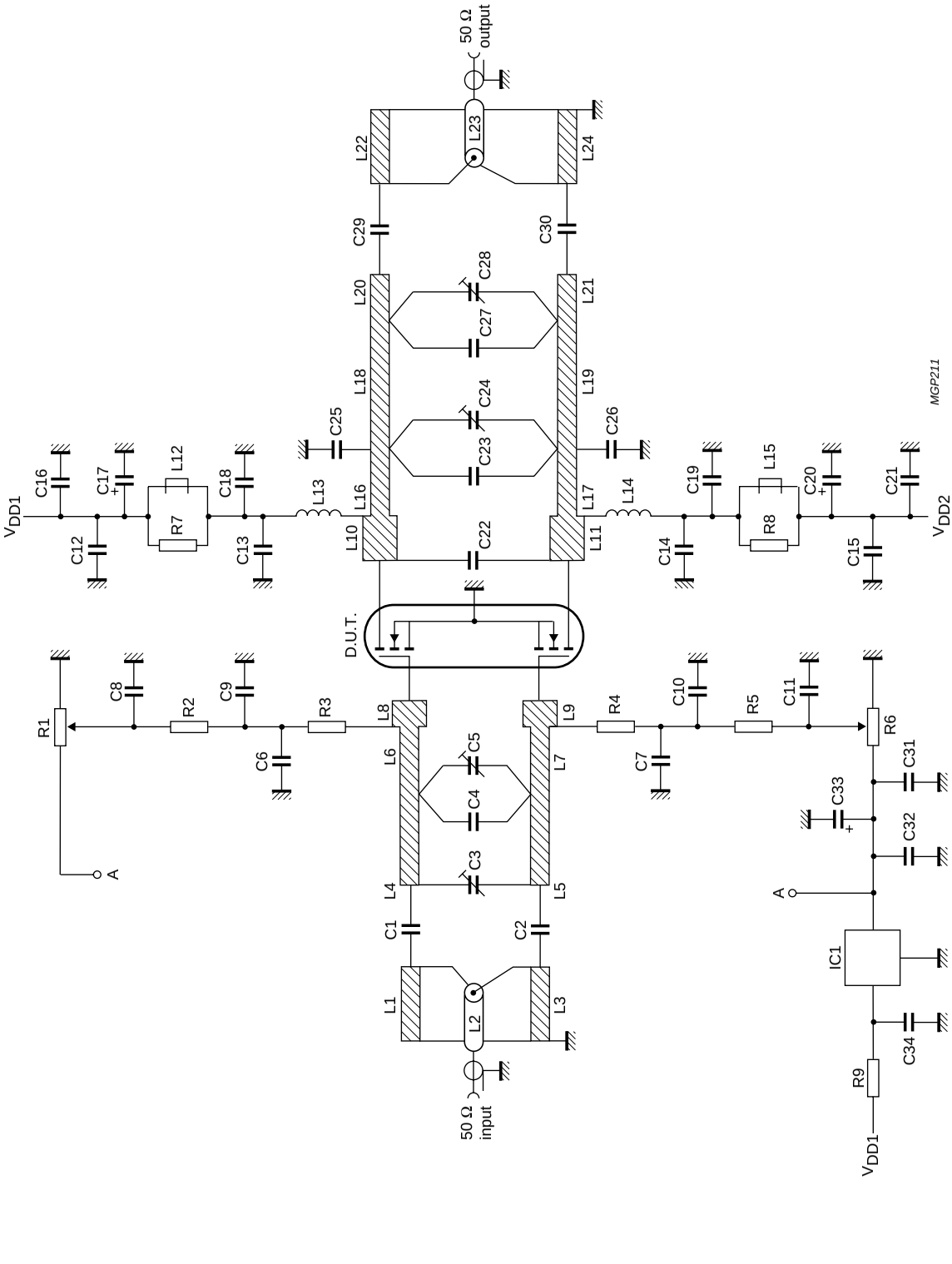


Fig.11 Test circuit for class-AB operation.

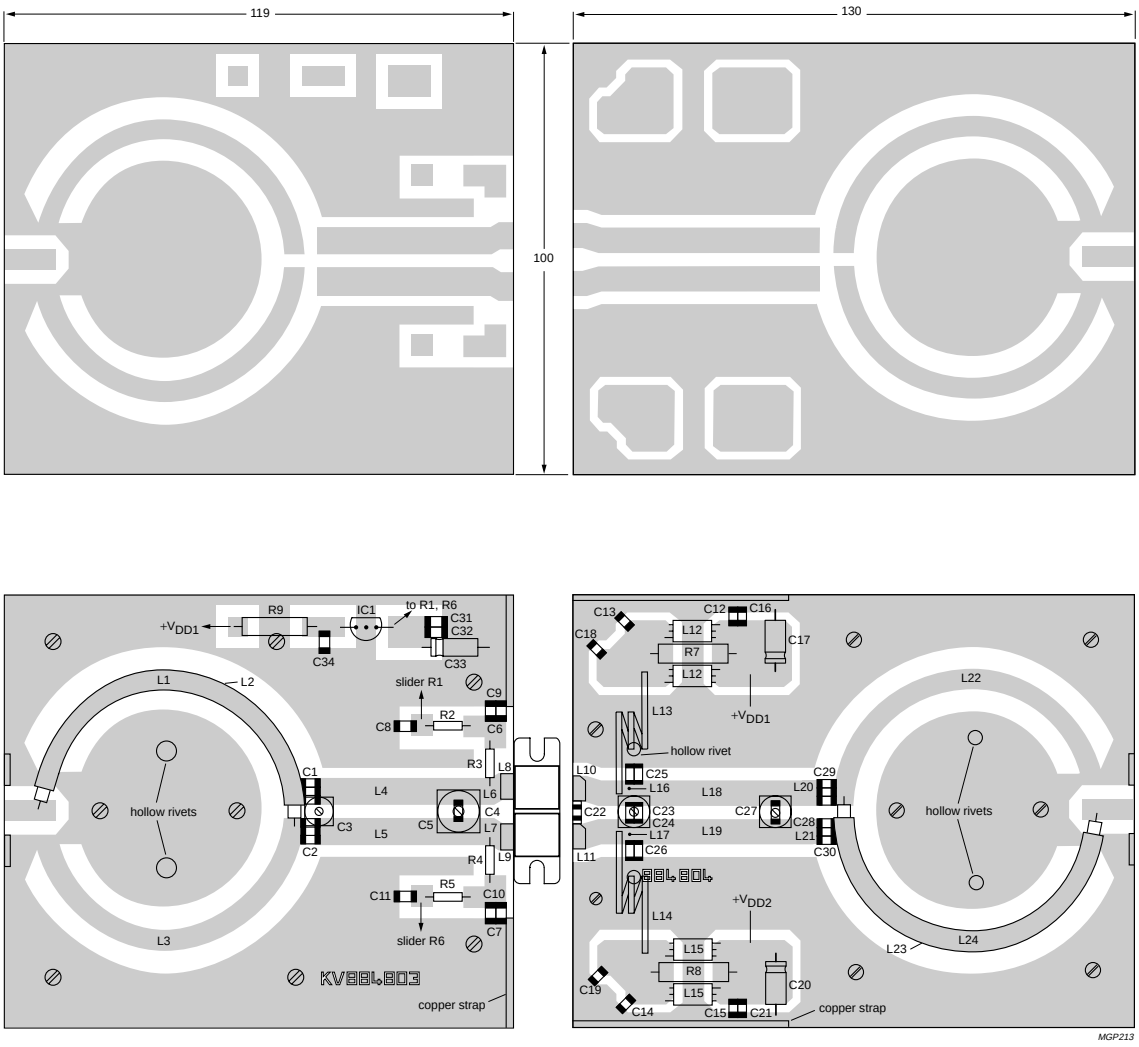
List of components (class-AB test circuit)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C2	multilayer ceramic chip capacitor (note 1)	2 × 56 pF + 18 pF in parallel, 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		
C8, C11, C16, C21, C32	multilayer ceramic chip capacitor	100 nF, 50 V		2222 852 47104
C13, C14, C18, C19	multilayer ceramic chip capacitor (note 1)	510 pF, 500 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. dia. 3.6 mm ext. conductor length 80 mm	
L4, L5	stripline (note 2)	43 Ω	6 × 32.5 mm	
L6, L7, L10, L11	stripline (note 2)	43 Ω	6 × 10.5 mm	
L8, L9	stripline (note 2)	43 Ω	6 × 3 mm	
L12, L15	grade 3B Ferroxcube wide-band HF choke	2 in parallel		4312 020 36642
L13, L14	2 turns enamelled 1.6 mm copper wire	25 nH	int. dia. 5 mm leads 2 × 7 mm space 2.5 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	0.4 W metal film resistor	1 kΩ		

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
R3, R4	0.4 W metal film resistor	536 Ω		
R7, R8	1 W metal film resistor	10 Ω ±5%		
R9	1 W metal film resistor	3.16 kΩ		
IC1	78L05 voltage regulator			

Notes

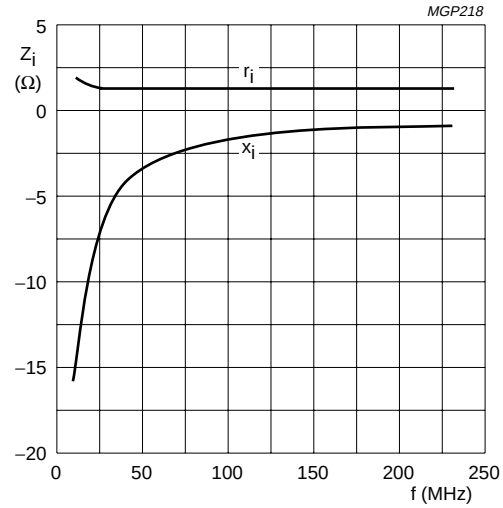
1. American Technical Ceramics (ATC) capacitor, type 100B or other capacitor of the same quality.
2. L1, L3 - L11, L16 - L22 and L24 are micro-striplines on a double copper-clad printed circuit board, with glass microfibre PTFE dielectric (ε_r = 2.2), thickness $^1/_{16}$ inch, thickness of copper sheet 2 × 35 μm.
3. L2 and L23 are soldered on striplines L1 and L24 respectively.
4. A copper strap, thickness 0.8 mm, is soldered on striplines L16 - L21.



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.

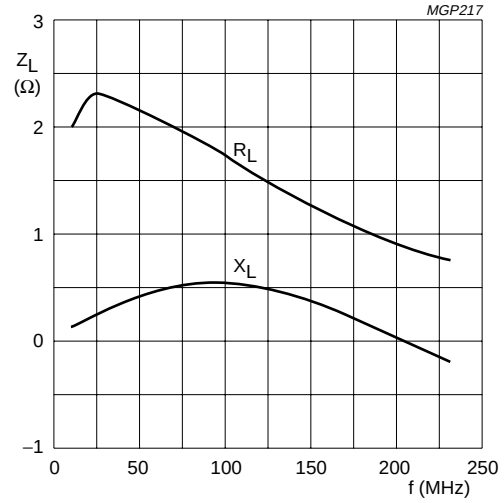
Dimensions in mm.

Fig.12 Component layout for 225 MHz class-AB test circuit.



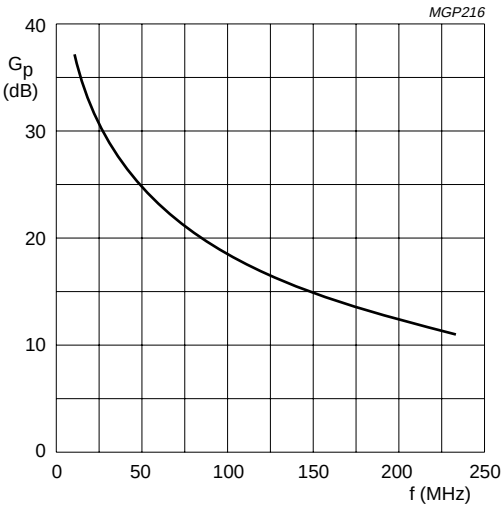
Class-AB operation; V_{DS} = 28 V; $I_D = 2 \times 250$ mA;
R_{GS} = 536 Ω (per section);
P_L = 300 W (total device); T_h = 25 °C.

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



Class-AB operation; V_{DS} = 28 V; $I_D = 2 \times 250$ mA;
R_{GS} = 536 Ω (per section);
P_L = 300 W (total device); T_h = 25 °C.

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

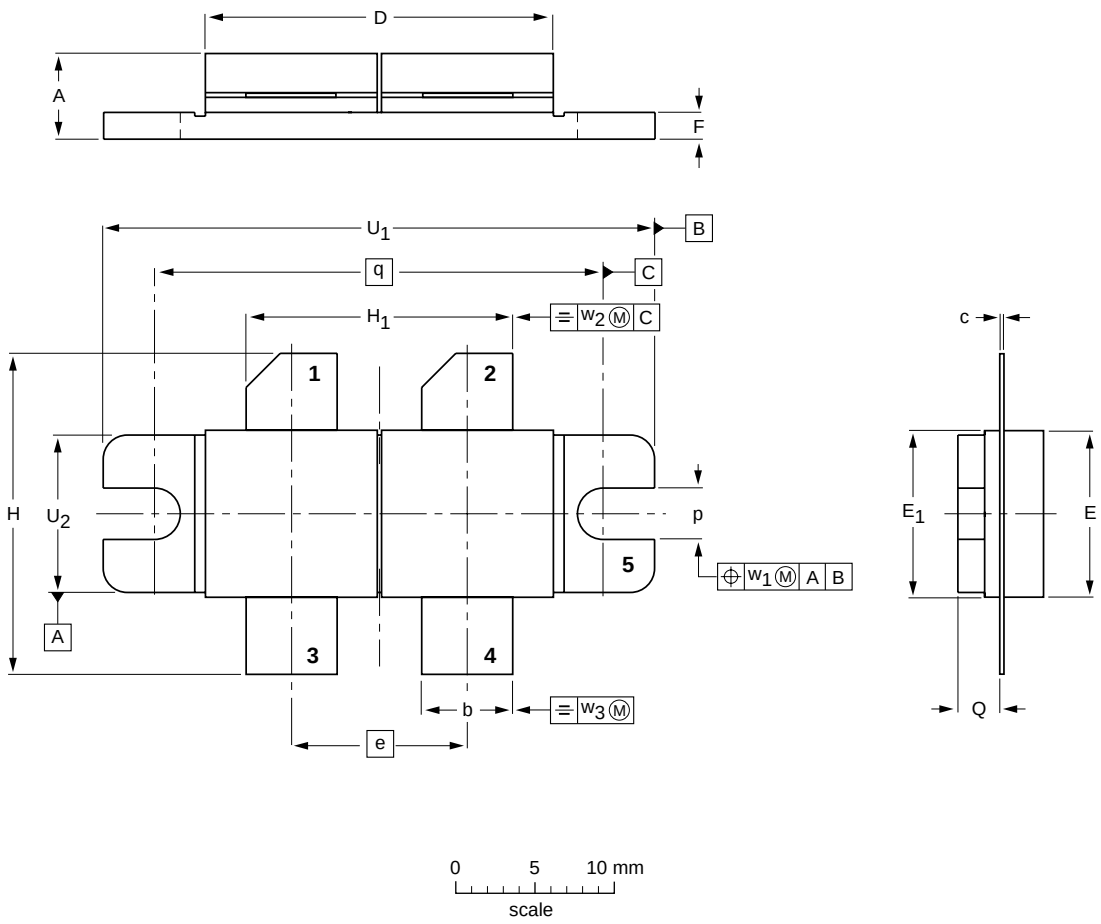


Class-AB operation; V_{DS} = 28 V; $I_D = 2 \times 250$ mA;
R_{GS} = 536 Ω (per section);
P_L = 300 W (total device); T_h = 25 °C.

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 **SOT262A1**



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

UNIT	A	b	c	D	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	5.85 5.58	0.16 0.10	21.98 21.71	11.05	10.27 10.05	10.29 10.03	1.78 1.52	20.58 20.06	17.02 16.51	3.28 3.02	2.85 2.59	27.94	34.17 33.90	9.91 9.65	0.51	1.02	0.25
inches	0.227 0.197	0.230 0.220	0.006 0.004	0.865 0.855	0.435	0.404 0.396	0.405 0.395	0.070 0.060	0.81 0.79	0.67 0.65	0.129 0.119	0.112 0.102	1.100	1.345 1.335	0.390 0.380	0.02	0.04	0.01

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT262A1						97-06-28

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.	

LIFE SUPPORT APPLICATIONS

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