

# DATA SHEET

**MF1011B900Y**

**Microwave power transistor**

Product specification  
Supersedes data of December 1994

1997 Feb 18

# Microwave power transistor

# MF1011B900Y

### FEATURES

- Suitable for short and medium pulse applications up to 100 μs pulse width, duty factor 10%
- Diffused emitter ballasting resistors improve ruggedness
- Interdigitated emitter-base structure provides high emitter efficiency
- Gold metallization with barrier realizes very stable characteristics and excellent lifetime
- Multicell geometry improves power sharing and reduces thermal resistance
- Internal input and output prematching networks allow an easier design of circuits.

### APPLICATIONS

Intended for use in common base class C broadband pulsed power amplifiers for IFF, TCAS and Mode S applications in the 1030 MHz to 1090 MHz band. Also suitable for medium pulse, heavy duty operation within this band.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT448A glued cap metal ceramic flange package, with base connected to flange.

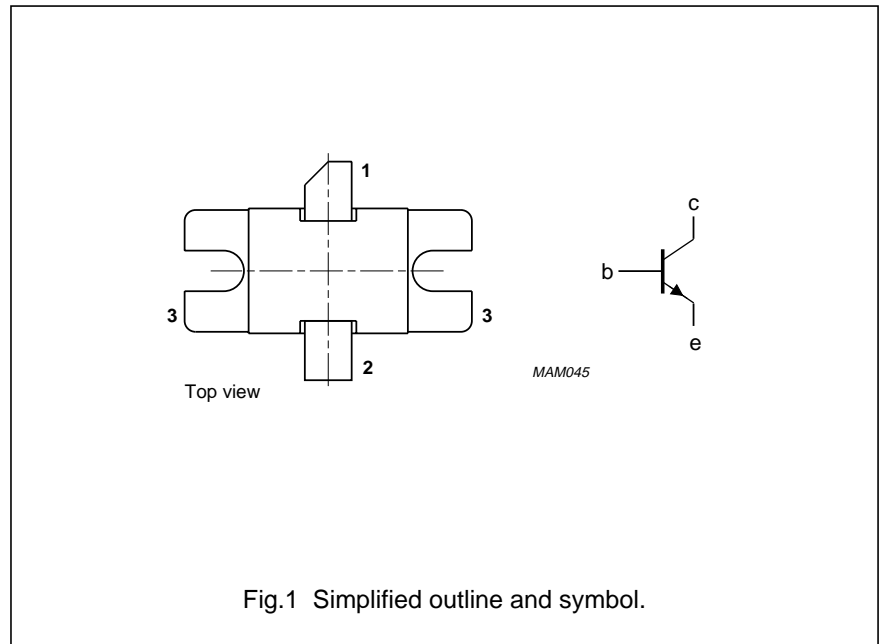
### QUICK REFERENCE DATA

Microwave performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in a common-base class C narrowband amplifier.

MODE OF OPERATION	CONDITIONS	f (GHz)	V <sub>CC</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	η <sub>c</sub> (%)
Class C	t <sub>p</sub> = 10 μs; δ = 1%	1.09	50	800	≥6	≥40

### PINNING - SOT448A

PIN	DESCRIPTION
1	collector
2	emitter
3	base connected to flange



### WARNING

#### Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is 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.

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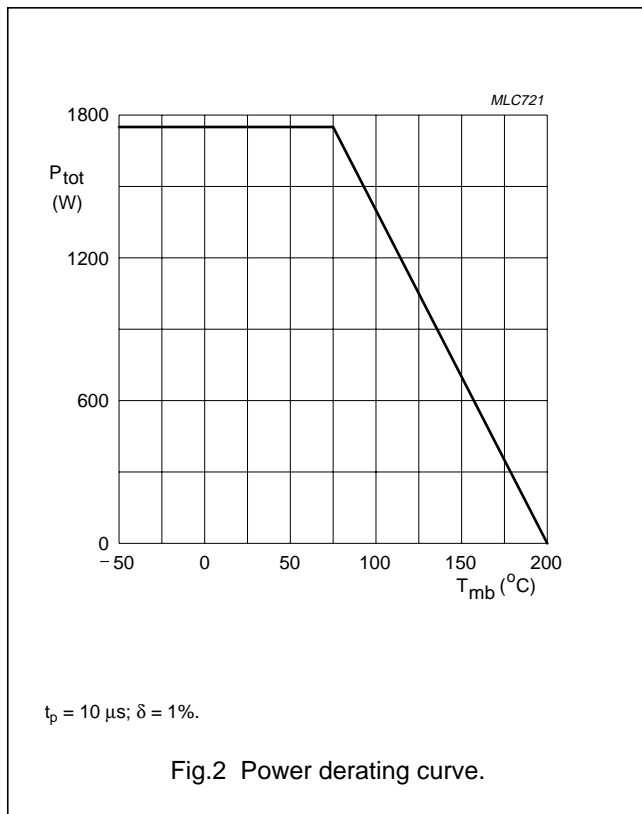
**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	65	V
$V_{CES}$	collector-emitter voltage	$R_{BE} = 0$	–	65	V
$V_{CEO}$	collector-emitter voltage	open base	–	15	V
$V_{EBO}$	emitter-base voltage	open collector	–	3	V
$I_{CM}$	peak collector current	$t_p = 10 \mu s; \delta = 1\%$	–	50	A
$P_{tot}$	total power dissipation	$T_{mb} < 75 \text{ }^\circ\text{C}; t_p \leq 10 \mu s; \delta \leq 1\%$	–	1750	W
$T_{stg}$	storage temperature		–65	+200	$^\circ\text{C}$
$T_j$	junction temperature		–	200	$^\circ\text{C}$
$T_{sld}$	soldering temperature	$t \leq 10 \text{ s}; \text{note 1}$	–	235	$^\circ\text{C}$

**Note**

- Up to 0.2 mm from ceramic.



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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting base	$T_j = 120\ ^\circ\text{C}$	0.84	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	note 1	0.2	K/W
$Z_{th}$	thermal impedance from junction to heatsink	$t_p = 10\ \mu\text{s}; \delta = 1\%$ ; notes 1 and 2	0.01	K/W

## Notes

1. See "Mounting recommendations in the General part of handbook SC19a".
2. Equivalent thermal impedance under pulsed microwave operating conditions.

## CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0; V_{CB} = 50\ \text{V}$	27	mA
$I_{CES}$	collector cut-off current	$V_{BE} = 0; V_{CE} = 50\ \text{V}$	27	mA
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = 1.5\ \text{V}$	7	mA
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 180\ \text{mA}$	65	V
$V_{(BR)CES}$	collector-emitter breakdown voltage	$I_C = 180\ \text{mA}; V_{BE} = 0$	65	V

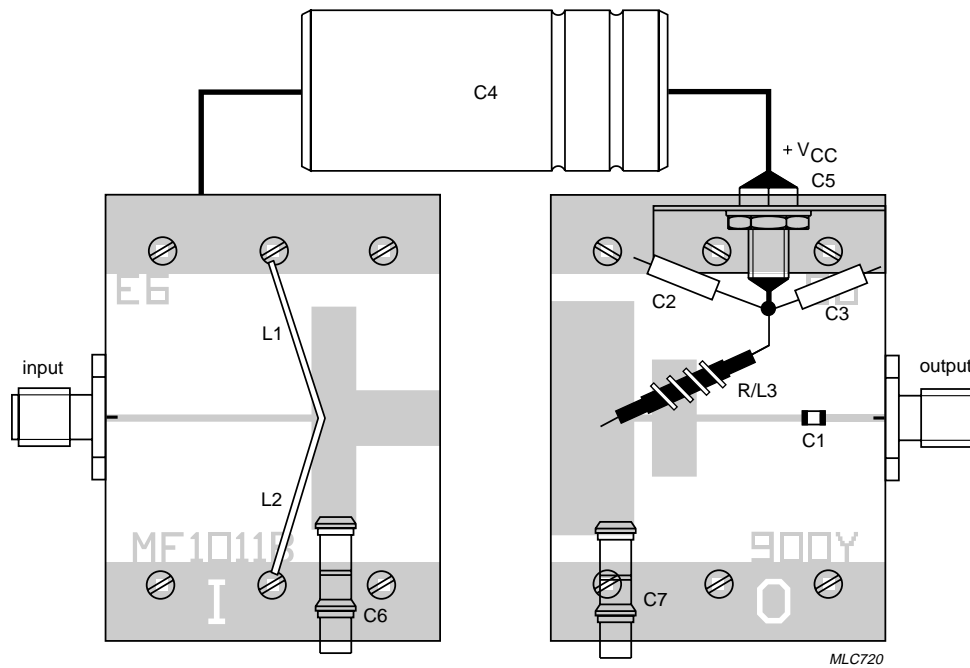
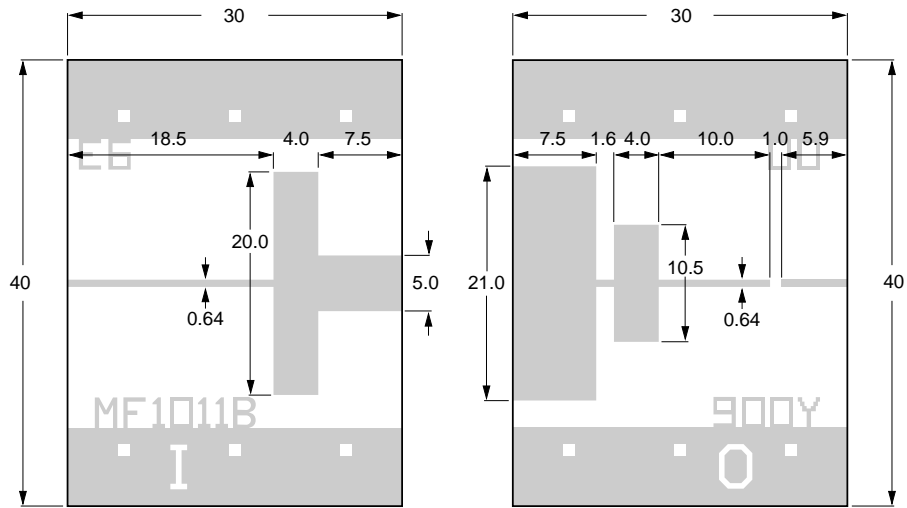
## APPLICATION INFORMATION

Microwave performance up to  $T_{mb} = 25\ ^\circ\text{C}$  in a common-base test circuit as shown in Fig.3.

MODE OF OPERATION	CONDITIONS	f (GHz)	$V_{CC}$ (V)	$P_L$ (W)	$G_p$ (dB)	$\eta_c$ (%)
Class C	$t_p = 10\ \mu\text{s}; \delta = 1\%$	1.09	50	$\geq 800$ typ. 900	$\geq 6$ typ. 6.5	$\geq 40$ typ. 48
	$t_p = 0.5\ \mu\text{s}; \delta = 50\%$ $t_p = 112\ \mu\text{s}; \delta = 1\%$	1.03 to 1.09	50	typ. 750	typ. 5.7	typ. 36
	$t_p = 32\ \mu\text{s}; \delta = 1\%$	1.09	50	typ. 870	typ. 6.3	typ. 46

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Dimensions in mm.  
 Substrate: Epsilam 10.  
 Thickness: 0.635 mm.  
 Permittivity:  $\epsilon_r = 10$ .

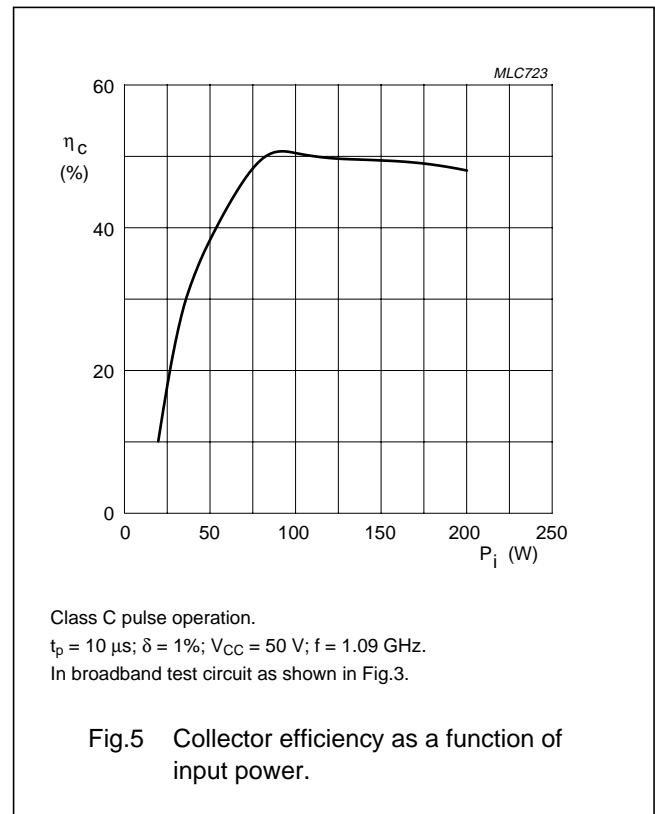
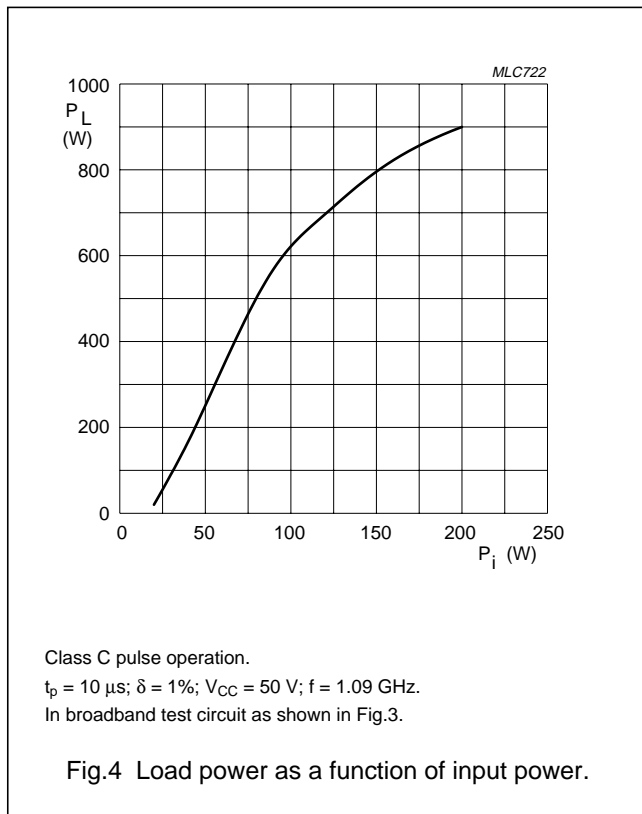
Fig.3 Broadband test circuit.

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List of components (see Fig.3)

COMPONENT	DESCRIPTION	VALUE	ORDERING INFORMATION
C1	capacitor	100 pF	ATC 100A101kp50x
C2,C3	tantalum capacitor	10 $\mu$ F; 50 V	
C4	electrolytic capacitor	1 mF; 63 V	
C5	feedthrough bypass capacitor		Erie 1250-003
C6, C7	variable gigatrim capacitor	0.8 to 8 pF	Tekelec 729-1
L1, L2	0.65 mm copper wire; total length = 26 mm; height of loop = 10 mm		
L3	4 turns 0.65 mm copper wire; total length = 48 mm		
R	resistor	4.7 $\Omega$ ; 0.5 W	



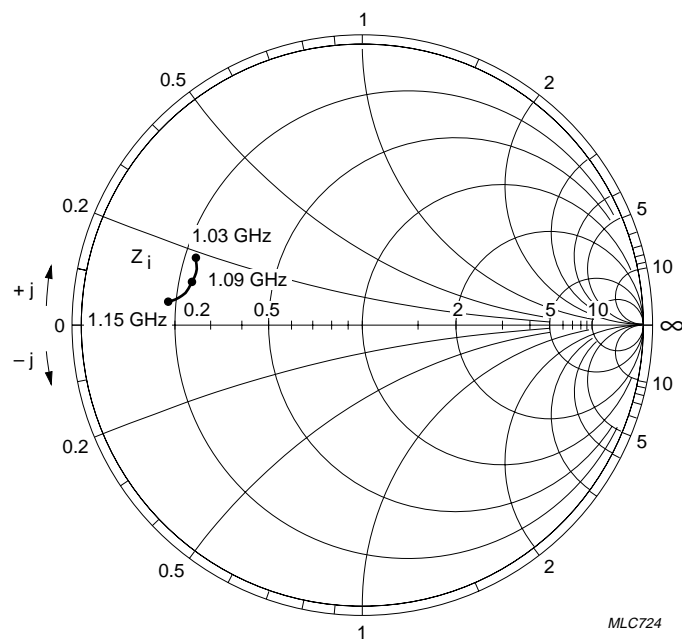
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Input and optimum load impedances

$V_{CE} = 50\text{ V}$ ; typical values at  $P_L = P_{L1}$  (see Figs 6 and 7).

f (GHz)	$Z_i$ ( $\Omega$ )	$Z_L$ ( $\Omega$ )
1.03	$0.22 + j0.19$	$0.14 - j0.10$
1.09	$0.23 + j0.12$	$0.12 - j0.08$
1.15	$0.19 + j0.06$	$0.09 - j0.09$

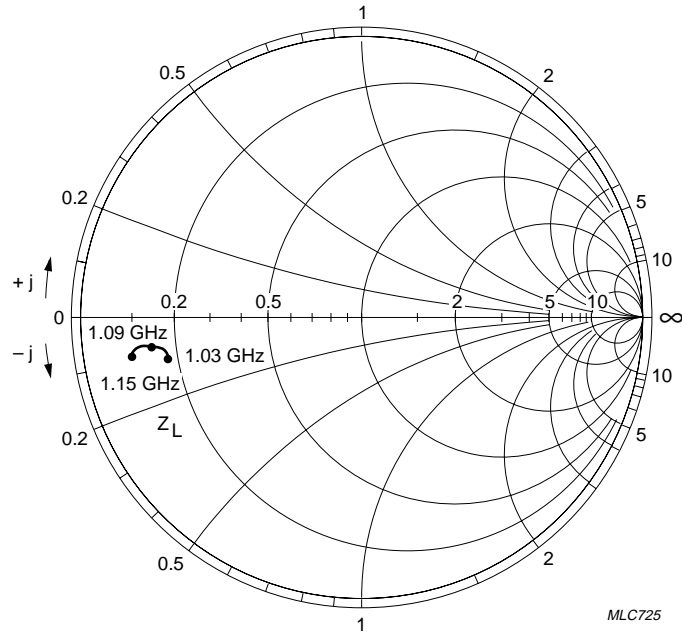


$V_{CC} = 50\text{ V}$ ;  $Z_o = 10\ \Omega$ ;  $P_o = 240\text{ W}$ .

Fig.6 Input impedance as a function of frequency.

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$V_{CC} = 50 \text{ V}; Z_o = 50 \Omega; P_o = 240 \text{ W}.$

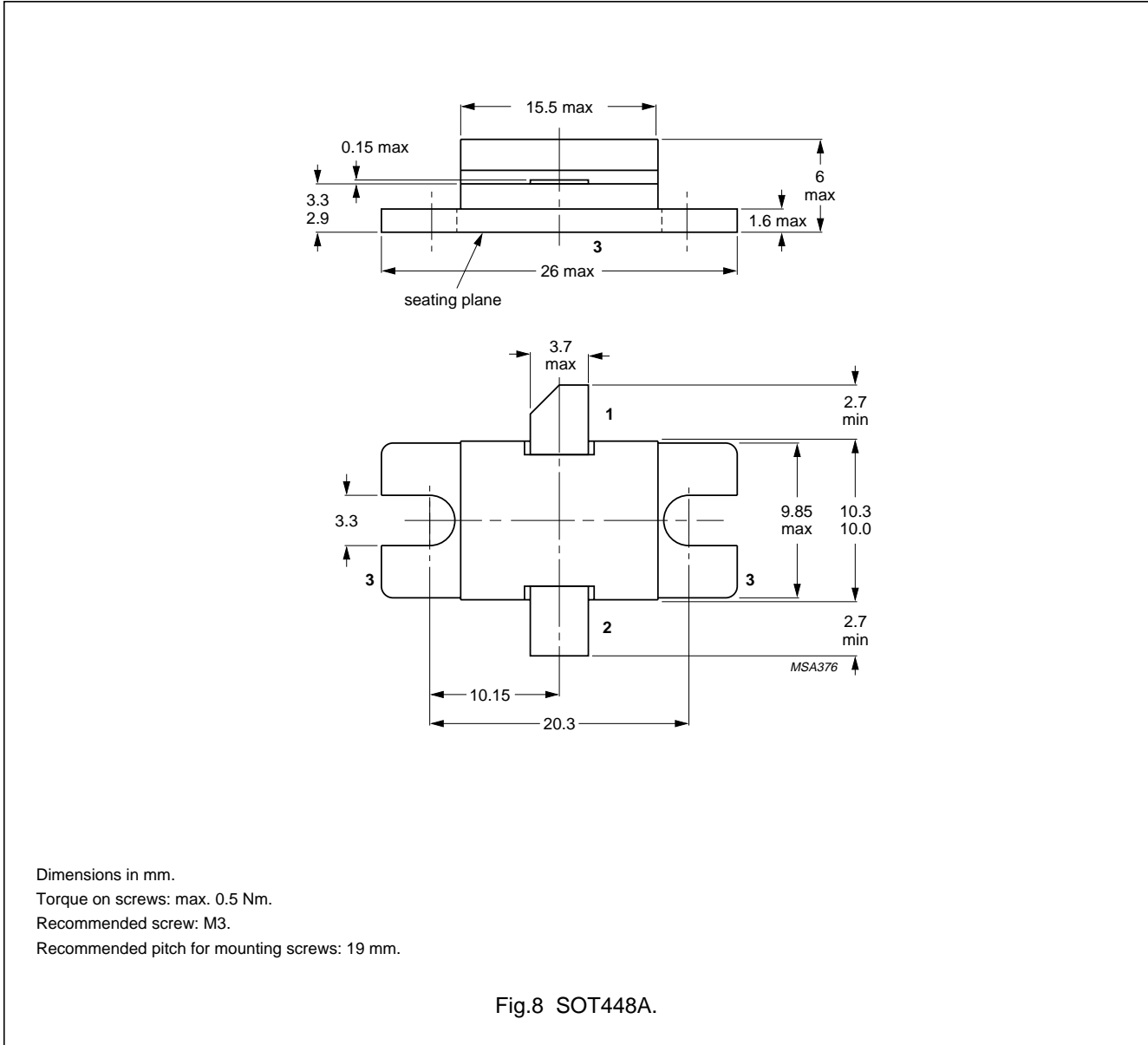
Fig.7 Optimum load impedance as a function of frequency.



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PACKAGE OUTLINE



## Microwave power transistor

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**DEFINITIONS**

<b>Data sheet status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

**LIFE SUPPORT APPLICATIONS**

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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