DATA SHEET

MF1011B900Y
Microwave power transistor

Product specification
Supersedes data of December 1994

1997 Feb 18

Philips
Semiconductors

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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 °C in a common-base class C narrowband amplifier.

MODE OF OPERATION	CONDITIONS	f (GHz)	V_{CC} (V)	P_L (W)	G_p (dB)	η_C (%)
Class C	t_p = 10 μs; δ = 1%	1.09	50	800	≥6	≥40

PINNING - SOT448A

PIN	DESCRIPTION
1	collector
2	emitter
3	base connected to flange

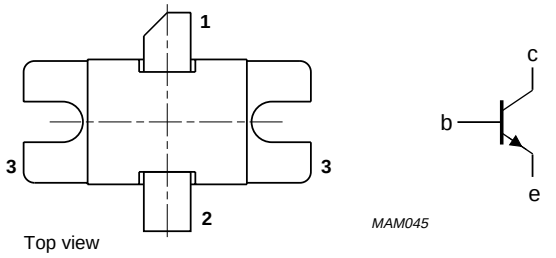


Fig.1 Simplified outline and symbol.

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.

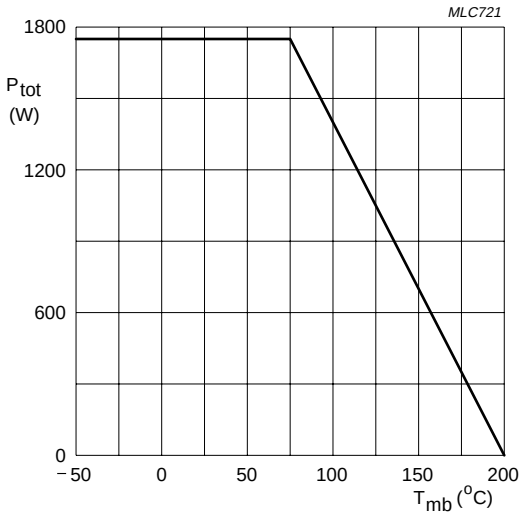
LIMITING VALUES

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 μs; δ = 1%	–	50	A
P_{tot}	total power dissipation	T_{mb} < 75 °C; t_p ≤ 10 μs; δ ≤ 1%	–	1750	W
T_{stg}	storage temperature		–65	+200	°C
T_j	junction temperature		–	200	°C
T_{sld}	soldering temperature	t ≤ 10 s; note 1	–	235	°C

Note

1. Up to 0.2 mm from ceramic.



t_p = 10 μs; δ = 1%.

Fig.2 Power derating curve.

THERMAL CHARACTERISTICS

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

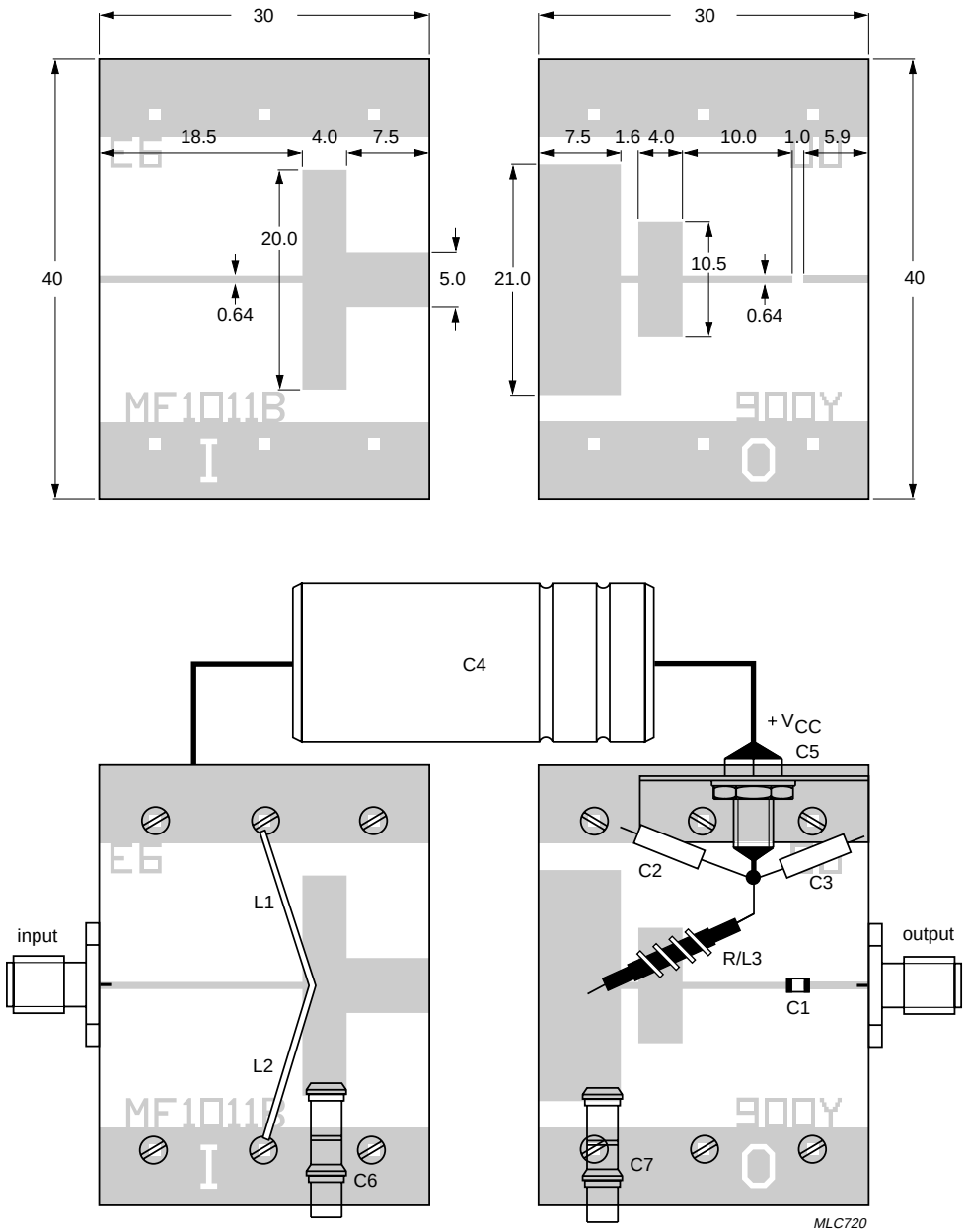
T_{mb} = 25 °C unless otherwise specified.

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

APPLICATION INFORMATION

Microwave performance up to T_{mb} = 25 °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)	η_C (%)
Class C	t_p = 10 μs; δ = 1%	1.09	50	≥800 typ. 900	≥6 typ. 6.5	≥40 typ. 48
	t_p = 0.5 μs; δ = 50% t_p = 112 μs; δ = 1%	1.03 to 1.09	50	typ. 750	typ. 5.7	typ. 36
	t_p = 32 μs; δ = 1%	1.09	50	typ. 870	typ. 6.3	typ. 46

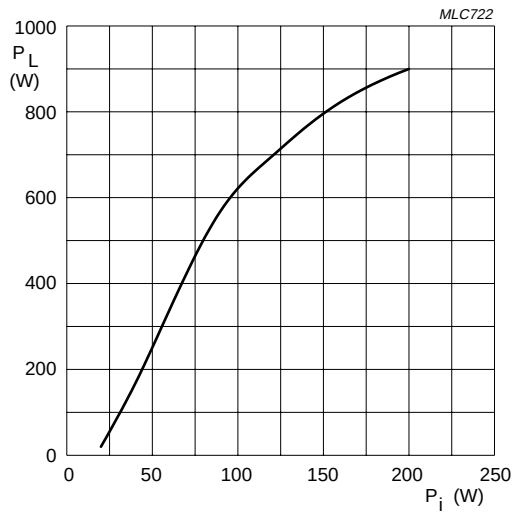


Dimensions in mm.
Substrate: Epsilam 10.
Thickness: 0.635 mm.
Permittivity: ε_r = 10.

Fig.3 Broadband test circuit.

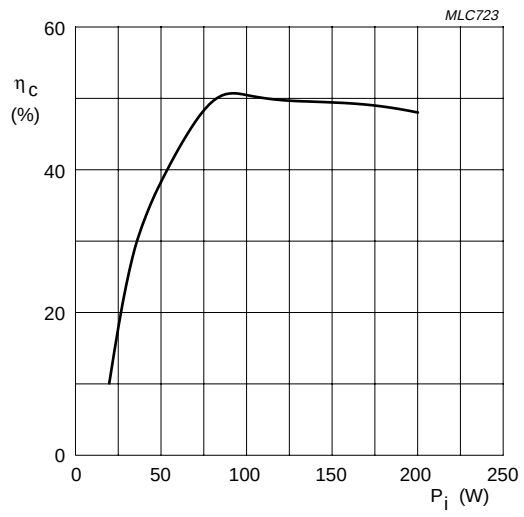
List of components (see Fig.3)

COMPONENT	DESCRIPTION	VALUE	ORDERING INFORMATION
C1	capacitor	100 pF	ATC 100A101kp50x
C2,C3	tantalum capacitor	10 μF; 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 Ω; 0.5 W	



Class C pulse operation.
t_p = 10 μs; δ = 1%; V_{CC} = 50 V; f = 1.09 GHz.
In broadband test circuit as shown in Fig.3.

Fig.4 Load power as a function of input power.



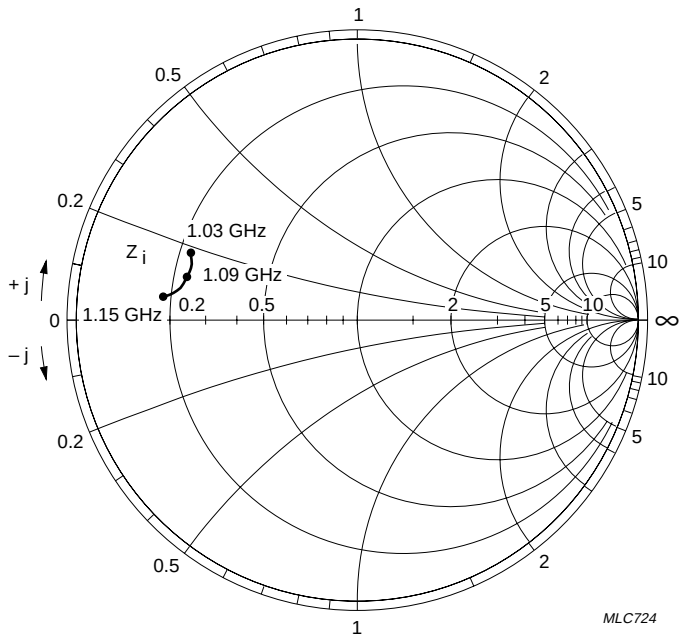
Class C pulse operation.
t_p = 10 μs; δ = 1%; V_{CC} = 50 V; f = 1.09 GHz.
In broadband test circuit as shown in Fig.3.

Fig.5 Collector efficiency as a function of input power.

Input and optimum load impedances

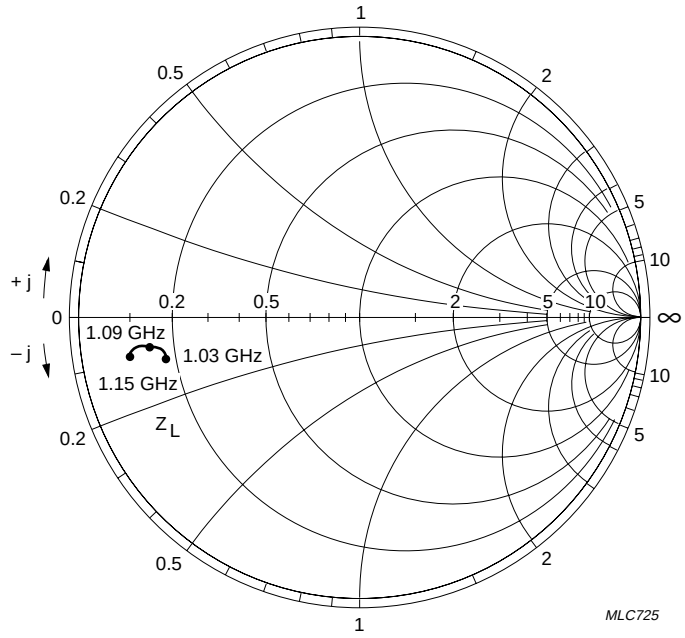
V_{CE} = 50 V; typical values at $P_L = P_{L1}$ (see Figs 6 and 7).

f (GHz)	Z_i (Ω)	Z_L (Ω)
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 V; Z_o = 10 Ω; P_o = 240 W.

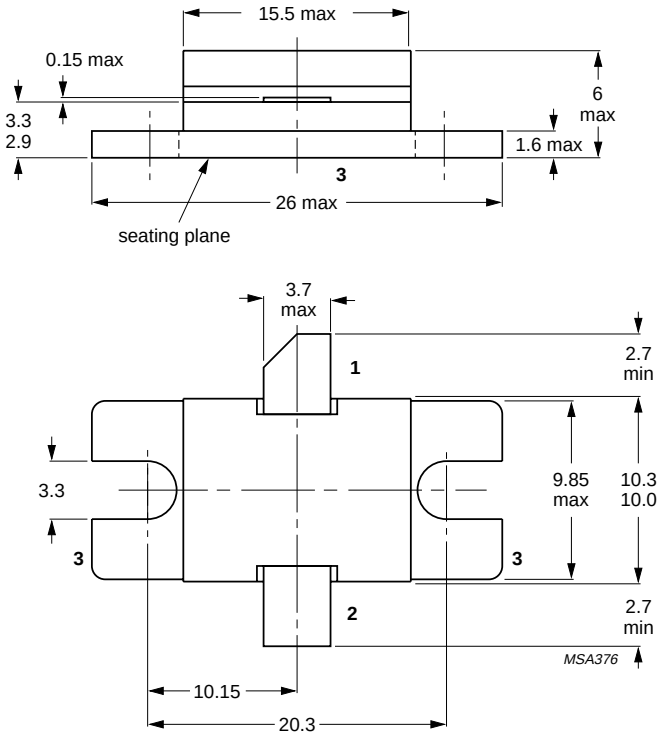
Fig.6 Input impedance as a function of frequency.



V_{CC} = 50 V; Z_o = 50 Ω; P_o = 240 W.

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

PACKAGE OUTLINE



Dimensions in mm.
Torque on screws: max. 0.5 Nm.
Recommended screw: M3.
Recommended pitch for mounting screws: 19 mm.

Fig.8 SOT448A.

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.	

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