

# DATA SHEET

**PTB23006U**

**Microwave power transistor**

Preliminary specification  
Supersedes data of December 1994

1997 Feb 19

# Microwave power transistor

# PTB23006U

### FEATURES

- Very high power gain
- Diffused emitter ballasting resistors improve ruggedness
- Interdigitated emitter-base structure
- Gold metallization with barrier layer to prevent electromigration and gold diffusion during life
- Multicell geometry improves power sharing and reduces thermal resistance
- Internal input prematching network.

### APPLICATIONS

Intended for use in common-base, class C power amplifiers at frequencies up to 2.3 GHz.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT440A hermetically sealed metal ceramic flange package, with base connected to flange.

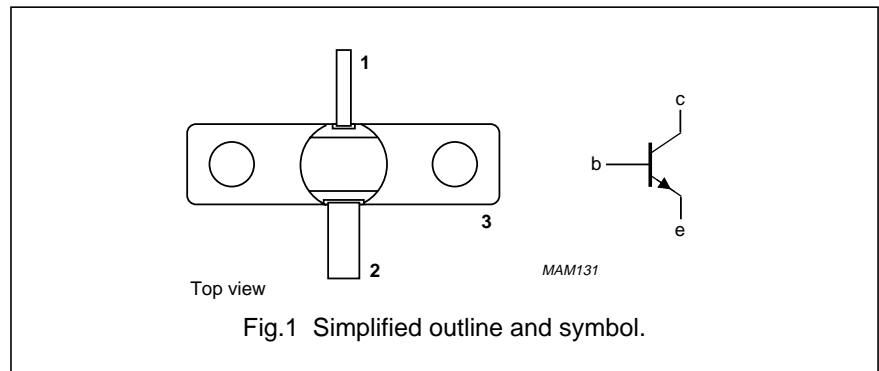
### QUICK REFERENCE DATA

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

MODE OF OPERATION	f (GHz)	V <sub>CC</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	η <sub>c</sub> (%)	Z <sub>i</sub> ; Z <sub>L</sub> (Ω)
Class C (CW)	2	28	>5	>9	>40	see Figs 5 and 6

### PINNING - SOT440A

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 disc 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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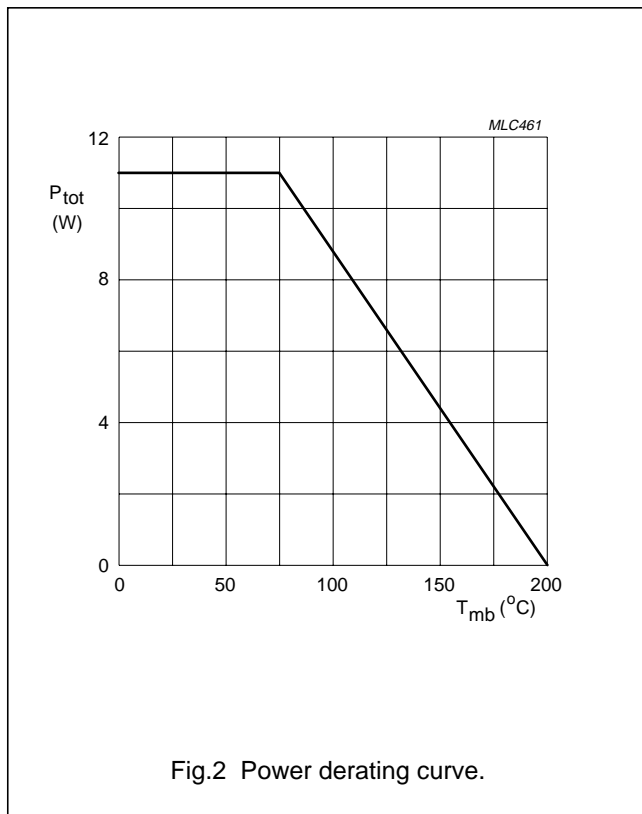
**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	40	V
$V_{CES}$	collector-emitter voltage	$R_{BE} = 0$	–	40	V
$V_{CEO}$	collector-emitter voltage	open base	–	15	V
$V_{EBO}$	emitter-base voltage	open collector	–	3	V
$I_C$	collector current		–	0.75	A
$P_{tot}$	total power dissipation	$T_{mb} = 75\text{ °C}$	–	11	W
$T_{stg}$	storage temperature		–65	+200	°C
$T_j$	junction temperature		–	200	°C
$T_{sld}$	soldering temperature	$t \leq 10\text{ s}$ ; note 1	–	235	°C

**Note**

1. 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	$T_j = 75\text{ °C}$	8.5	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	note 1	0.7	K/W

## Note

1. See "Mounting recommendations in the General part of handbook SC19a".

## CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CES}$	collector cut-off current	$I_E = 0; V_{CE} = 30\text{ V}$	–	300	$\mu\text{A}$
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 3\text{ mA}; I_E = 0$	40	–	V
$V_{(BR)CES}$	collector-emitter breakdown voltage	$I_C = 3\text{ mA}; R_{BE} = 0$	40	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 1.5\text{ mA}$	3	–	V
$h_{FE}$	DC current gain	$I_C = 450\text{ mA}; V_{CE} = 3\text{ V}$	15	150	

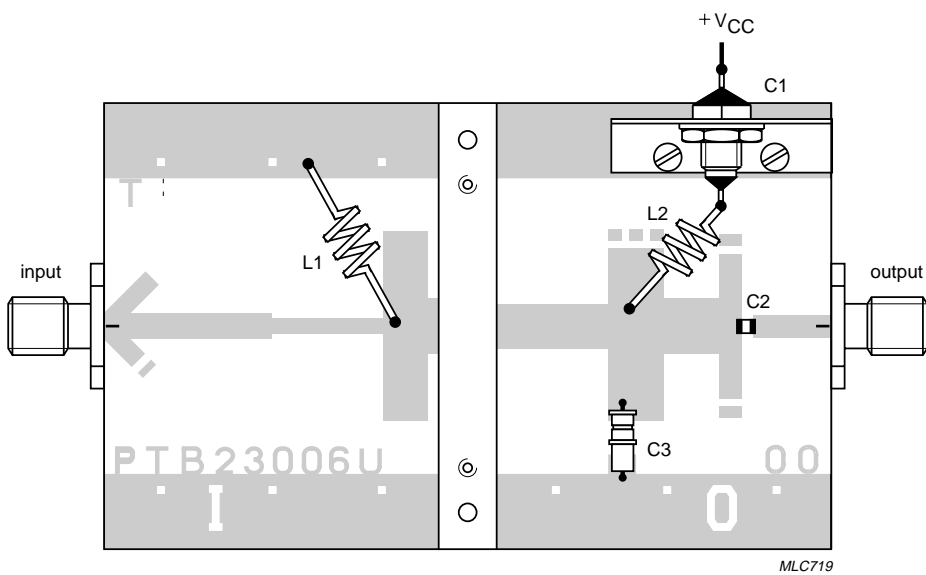
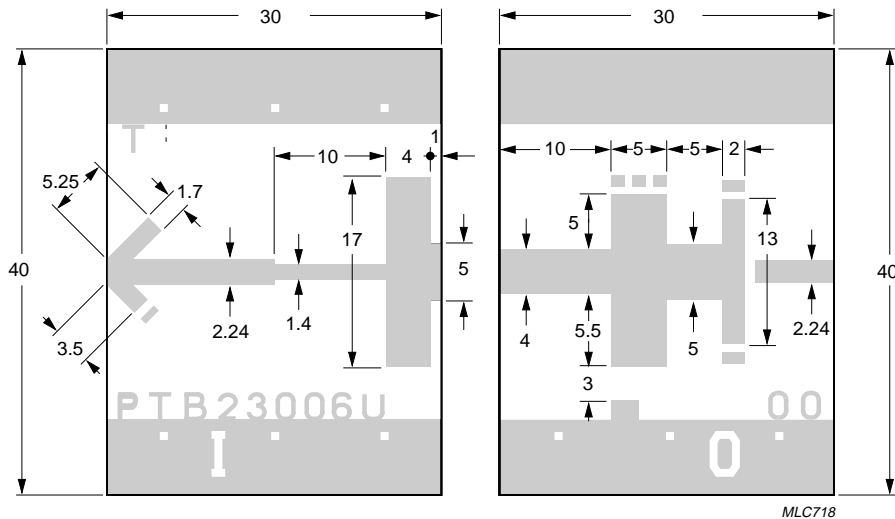
## APPLICATION INFORMATION

Microwave performance up to  $T_{mb} = 25\text{ °C}$  in a common-base class C test circuit.

MODE OF OPERATION	f (GHz)	$V_{CE}$ (V)	$P_L$ (W)	$G_p$ (dB)	$\eta_c$ (%)	$Z_i; Z_L$ ( $\Omega$ )
class C (CW)	2	28	>5 typ. 5.8	>9 typ. 10.5	>40 typ. 45	see Figs 5 and 6

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Dimensions in mm.  
 Substrate: PTFE fibreglass.  
 Thickness: 0.8 mm.  
 Permittivity:  $\epsilon_r = 2.54$ .

Fig.3 Prematching test circuit.

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List of components (see Fig.3)

COMPONENT	DESCRIPTION	VALUE	ORDERING INFORMATION
C1	feedthrough bypass capacitor		Erie1250-003
C2	DC blocking chip capacitor	100 pF	
C3	tuning capacitor	0.5 to 5 pF	Tekelec 5855
L1, L2	3 turns 0.5 mm copper wire; internal diameter = 2 mm		

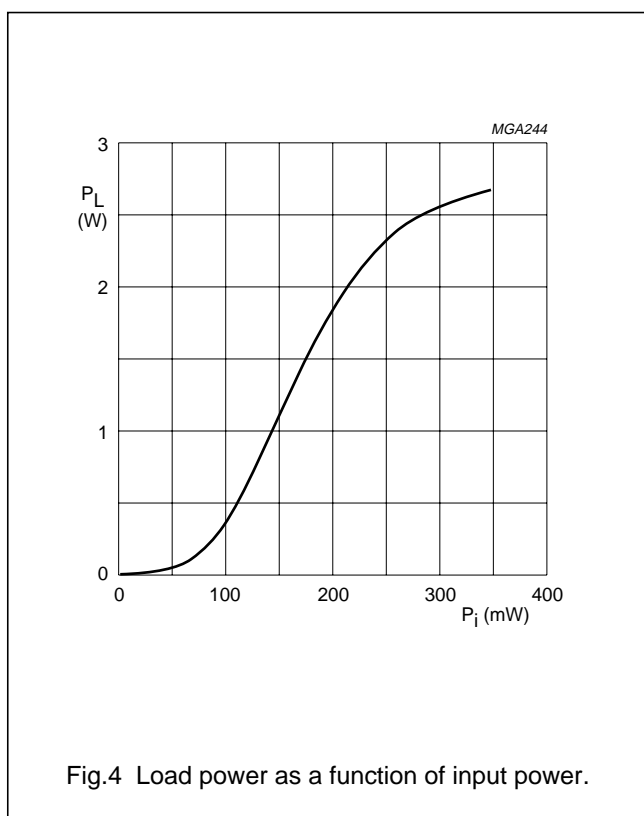
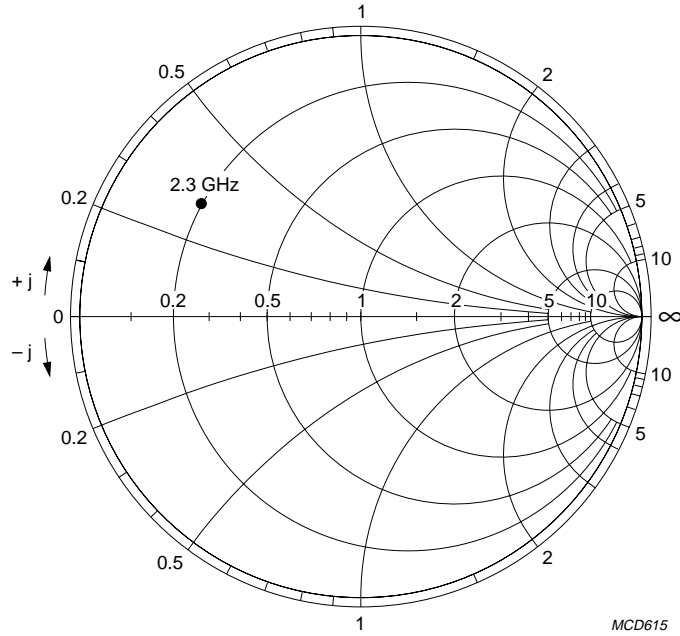


Fig.4 Load power as a function of input power.

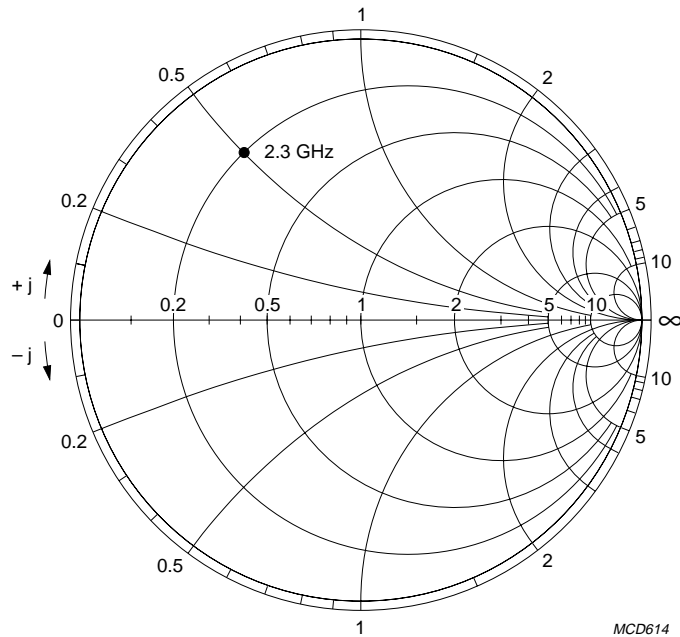
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$V_{CC} = 28 \text{ V}; Z_o = 50 \Omega; P_L = 2.3 \text{ W}.$

Fig.5 Input impedance as a function of frequency.



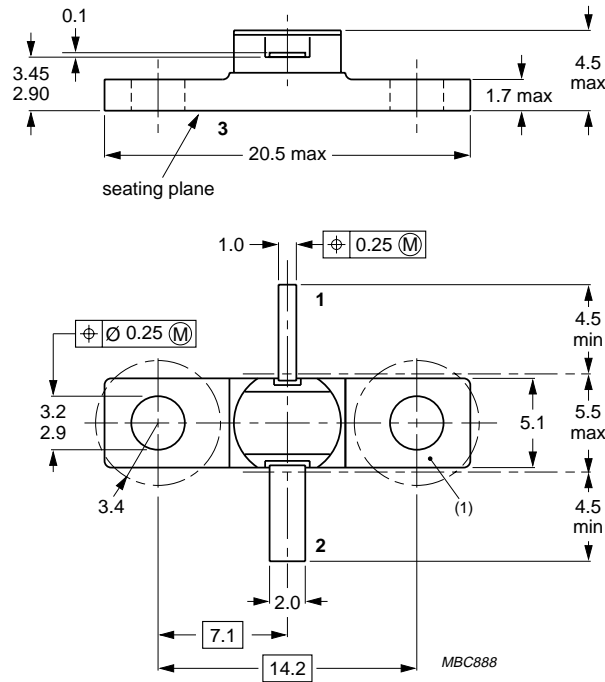
$V_{CC} = 28 \text{ V}; Z_o = 50 \Omega; P_L = 2.3 \text{ W}.$

Fig.6 Optimum load impedance as a function of frequency.

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PACKAGE OUTLINE



Dimensions in mm.

Torque on nut: max. 0.4 Nm.

Recommended screw: M2.5.

(1) Flatness of this area ensures full thermal contact with bolt head.

Fig.7 SOT440A.



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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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**NOTES**

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**NOTES**

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