

DISCRETE SEMICONDUCTORS

DATA SHEET

PTB23002U

NPN microwave power transistor

Product specification
Supersedes data of November 1994

1997 Feb 19

NPN microwave power transistor

PTB23002U

FEATURES

- Very high power gain
- Internal input prematching network
- 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.

APPLICATIONS

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.

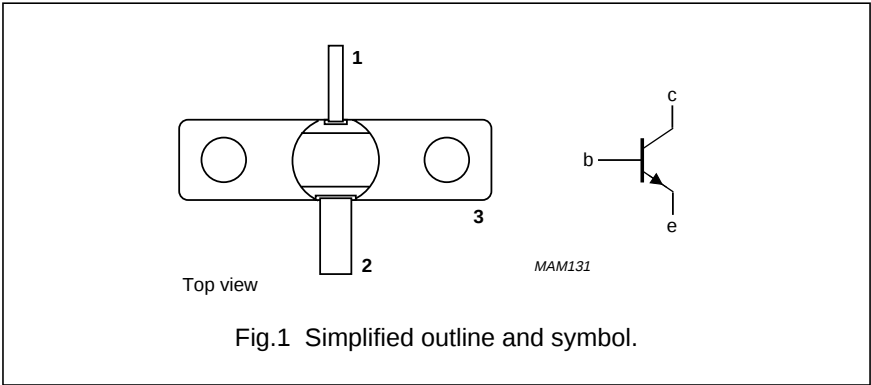
QUICK REFERENCE DATA

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 _{CC} (V)	P _L (W)	G _p (dB)	η _c (%)	Z _i ; Z _L (Ω)
Class C (CW)	2.3	28	>2	>9	>45	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 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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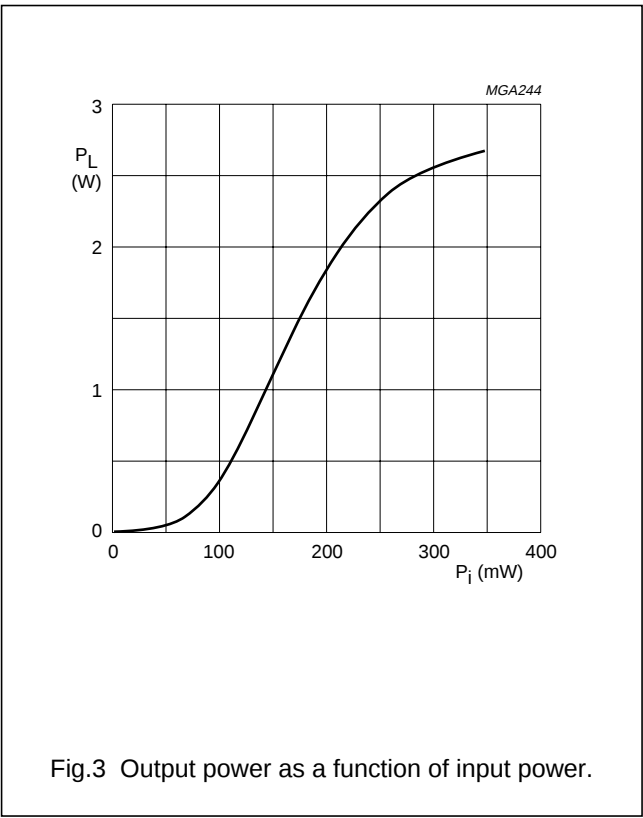
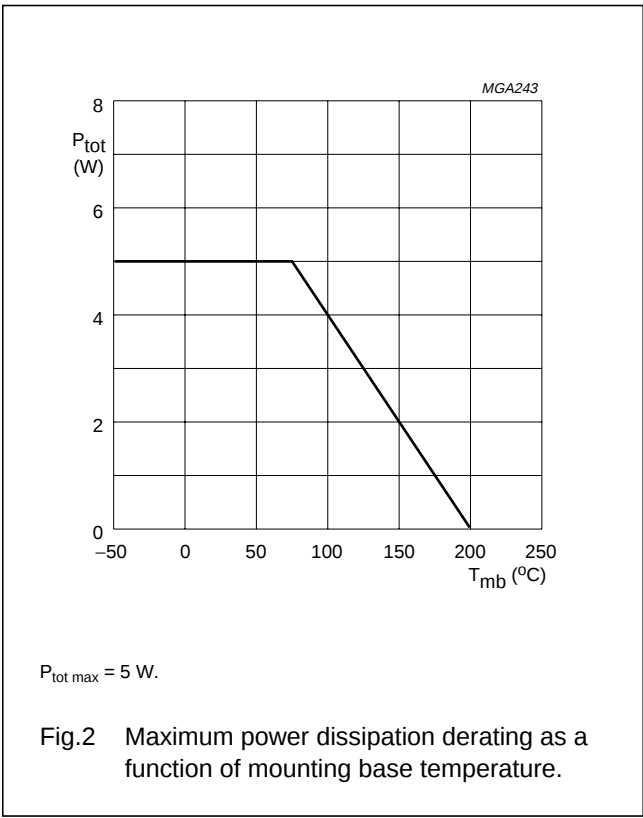
LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V _{CBO}	collector-base voltage	open emitter	–	40	V
V _{CEO}	collector-emitter voltage	open base	–	15	V
V _{CES}	collector-emitter voltage	R _{BE} = 0 Ω	–	40	V
V _{EBO}	emitter-base voltage	open collector	–	3	V
I _C	collector current (DC)		–	0.25	A
P _{tot}	total power dissipation	T _{mb} = 75 °C	–	5	W
T _{stg}	storage temperature		–65	+200	°C
T _j	operating junction temperature		–	200	°C
T _{sld}	soldering temperature	t ≤ 10 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	$T_j = 75\ ^\circ\text{C}$	22	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	note 1	0.7	K/W

Note

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

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 1\ \text{mA}; I_E = 0$	40	–	V
$V_{(BR)CES}$	collector-emitter breakdown voltage	$I_C = 1\ \text{mA}; R_{BE} = 0\ \Omega$	40	–	V
I_{CBO}	collector cut-off current	$V_{CE} = 30\ \text{V}; I_E = 0$	–	15	μA
I_{EBO}	emitter cut-off current	$V_{EB} = 1.5\ \text{V}; I_C = 0$	–	1.5	μA

APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\ ^\circ\text{C}$ in a common-base test circuit as shown in Fig.4 and working in CW class C mode.

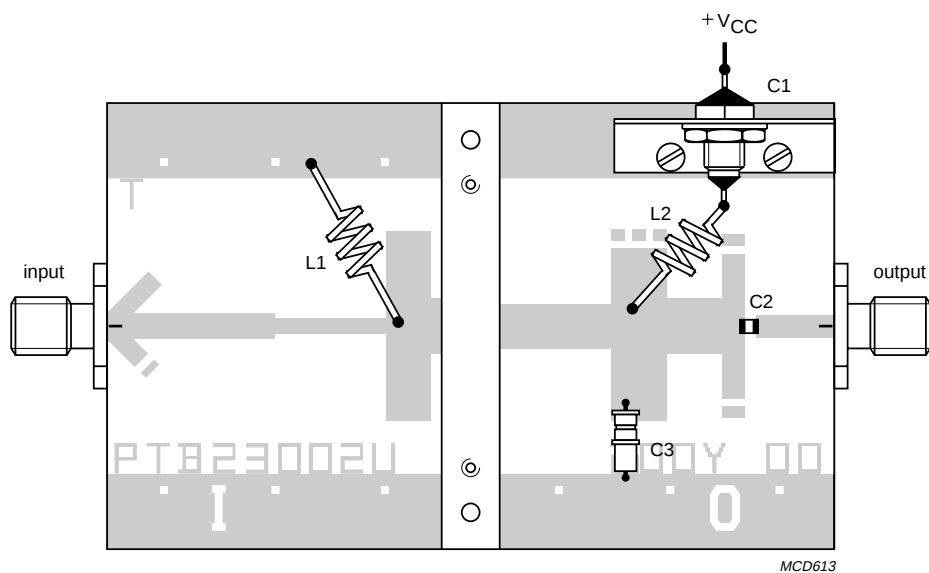
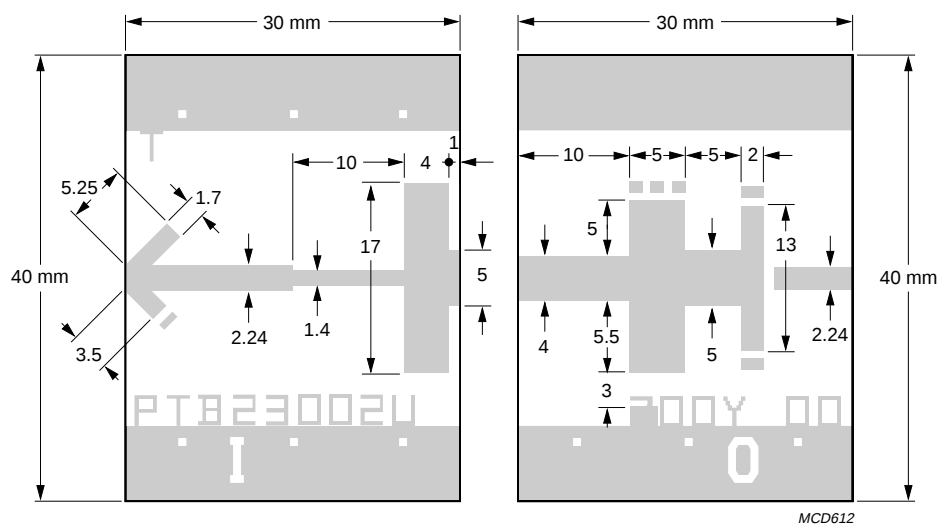
MODE OF OPERATION	f (GHz)	V_{CC} (V)	P_L (W)	G_p (dB)	η_c (%)	$Z_i; Z_L$ (Ω)
Class C (CW)	2.3	28	≥ 2 ; typ. 2.3	≥ 9 ; typ. 9.6	≥ 45 ; typ. 50	see Figs 5 and 6

List of components (see Fig.4)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L1, L2	3 turns 0.5 mm diameter copper wire		int.dia. = 2 mm	
C1	feedthrough bypass capacitor			Erie, ref.1250-003
C2	DC blocking capacitor	100 pF		
C3	tuning capacitor	0.5 - 5 pF		Tekelec 5855

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

Fig.4 Prematching test circuit.

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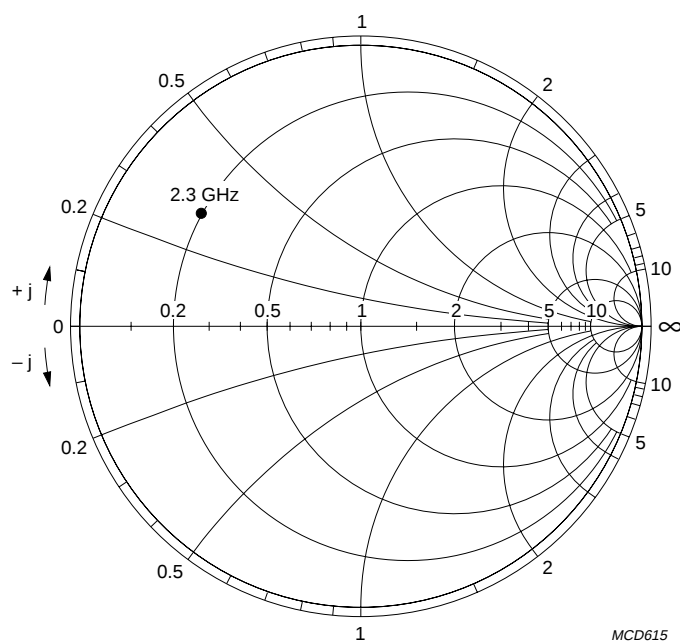
 $V_{CC} = 28 \text{ V}; Z_0 = 50 \Omega; P_L = 2.3 \text{ W}.$

Fig.5 Input impedance as a function of frequency.

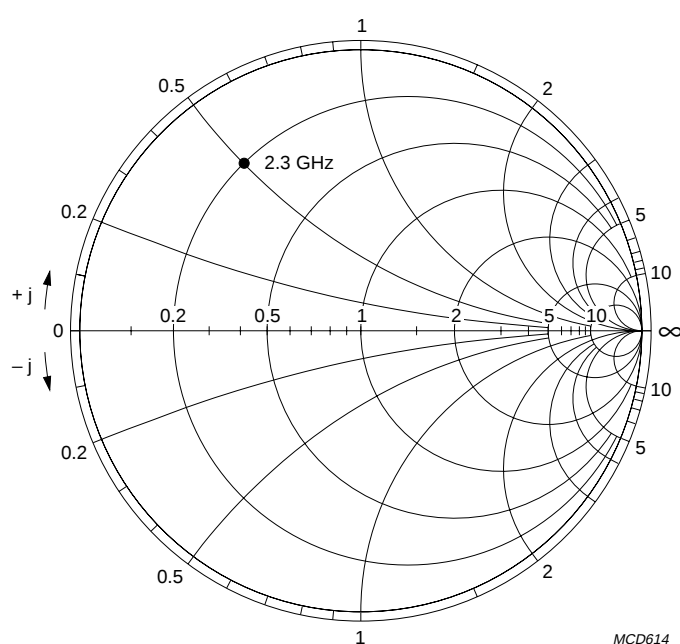
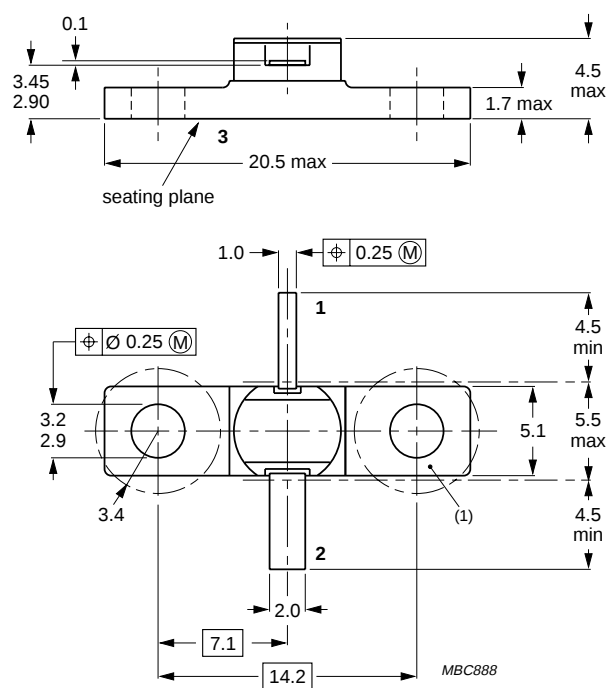
 $V_{CC} = 28 \text{ V}; Z_0 = 50 \Omega; P_L = 2.3 \text{ W}.$

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: M3

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

Fig.7 SOT440A.

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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

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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