

# DATA SHEET

**MTB10010U**

**NPN microwave power transistor**

Product specification  
Supersedes data of November 1994

1997 Feb 20

# NPN microwave power transistor

# MTB10010U

### FEATURES

- Input prematching cell allows an easier design of circuits
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Interdigitated structure provides high emitter efficiency
- Gold metallization realizes very good characteristics stability and excellent lifetime
- Multicell geometry gives good balance of dissipated power and low thermal resistance.

### APPLICATIONS

Common base class C narrowband pulsed power amplifiers at 1 030 MHz for IFF applications.

### DESCRIPTION

NPN silicon planar epitaxial microwave transistor with internal input prematching cell in a SOT440A metal ceramic package with base connected to flange.

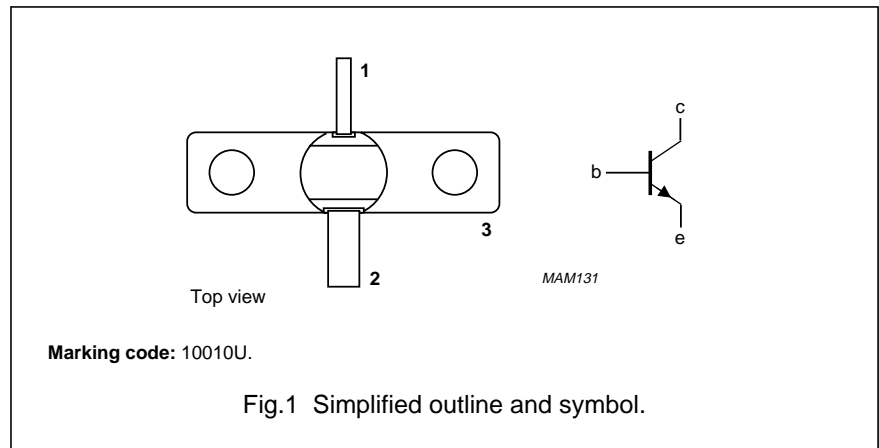
### QUICK REFERENCE DATA

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

MODE OF OPERATION	CONDITIONS	f (MHz)	V <sub>CC</sub> (V)	P <sub>L</sub> (W)	G <sub>PO</sub> (dB)	η <sub>C</sub> (%)	Z <sub>i</sub> /Z <sub>L</sub> (Ω)
Class C	t <sub>p</sub> = 1 μs; δ = 1%	1030	24	>9.5	>9.5	>50	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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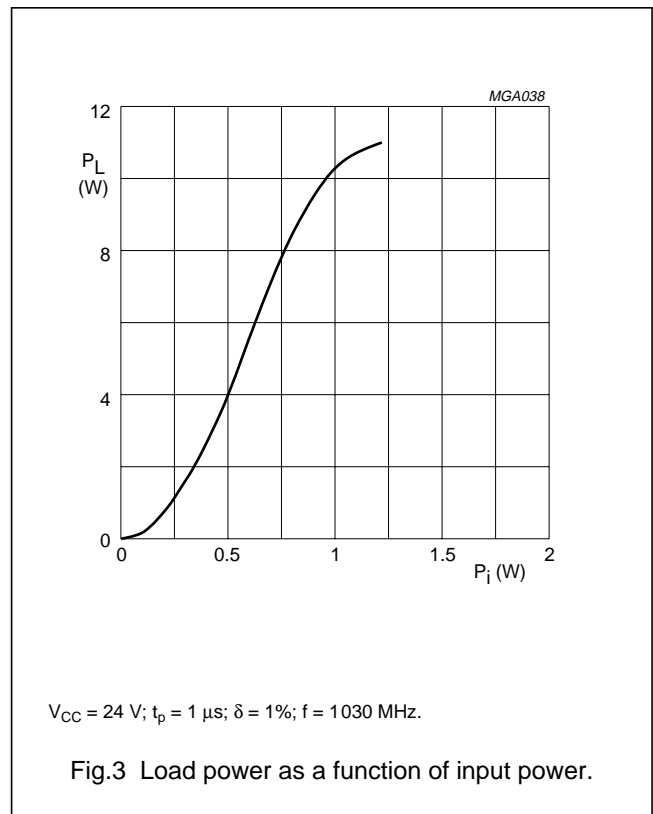
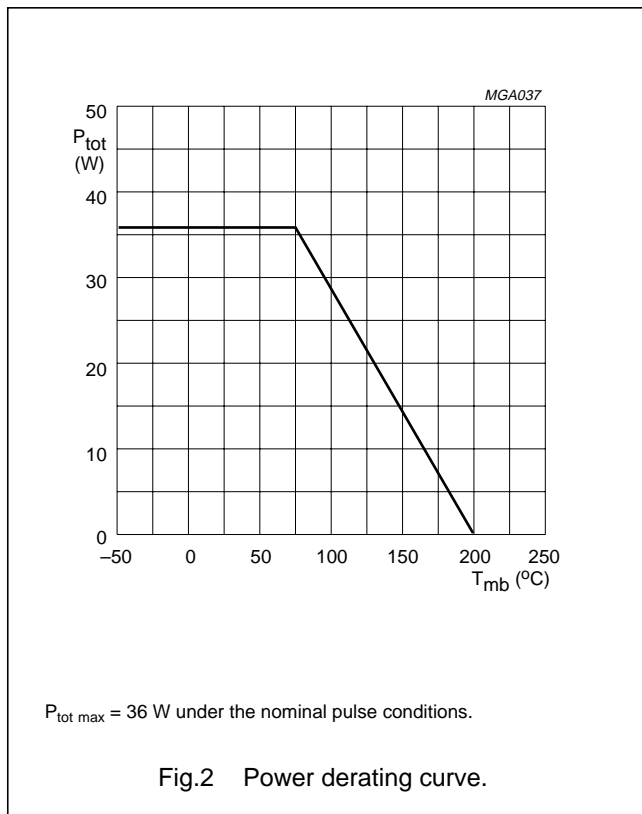
**LIMITING VALUES**

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	$R_{BE} = 0 \Omega$	–	40	V
$V_{EBO}$	emitter-base voltage	open collector	–	3	V
$I_C$	collector current (average)		–	0.75	A
$P_{tot}$	total power dissipation	$T_{mb} < 75 \text{ }^\circ\text{C}$ ; $t_p = 1 \mu\text{s}$ ; $\delta = 1\%$	–	36	W
$T_{stg}$	storage temperature		–65	+200	$^\circ\text{C}$
$T_j$	junction temperature		–	200	$^\circ\text{C}$
$T_{sld}$	soldering temperature	$t \leq 10 \text{ s}$ ; note 1	–	235	$^\circ\text{C}$

**Note**

- Up to 0.3 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	$T_j = 100\ ^\circ\text{C}$	10.5	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	note 1	0.7	K/W
$Z_{th\ j-mb}$	thermal impedance from junction to mounting base	$t_p = 1\ \mu\text{s}; \delta = 1\%$ ; note 1	2.5	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	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 30\ \text{V}; I_E = 0$	45	$\mu\text{A}$
$I_{CES}$	collector cut-off current	$V_{CE} = 30\ \text{V}; R_{BE} = 0$	300	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current	$V_{EB} = 1.5\ \text{V}; I_C = 0$	4.5	$\mu\text{A}$

## APPLICATION INFORMATION

Microwave performance up to  $T_{mb} = 25\ ^\circ\text{C}$  and working in pulsed conditions in a narrowband test circuit as shown in Fig.4.

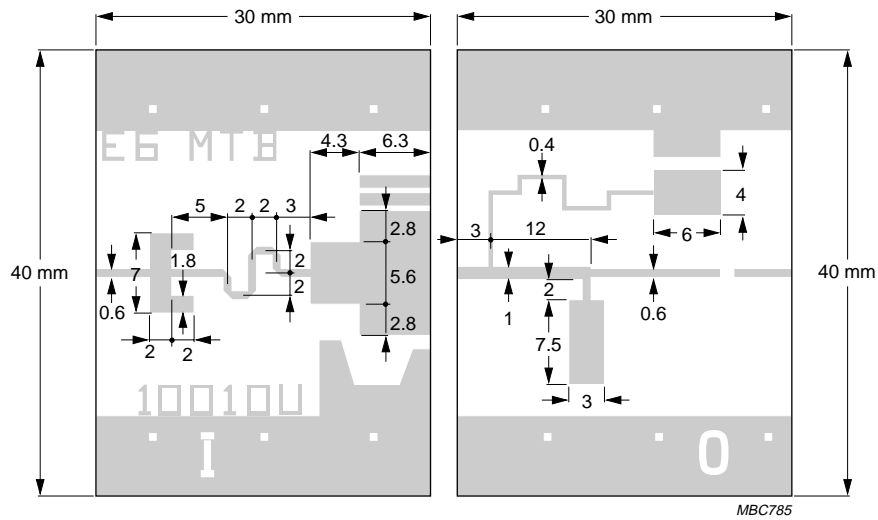
MODE OF OPERATION	CONDITIONS	f (MHz)	$V_{CC}$ (V)	$P_L$ (W)	$G_{po}$ (dB)	$\eta_c$ (%)	$Z_i/Z_L$ ( $\Omega$ )
Class C	$t_p = 1\ \mu\text{s}; \delta = 1\%$	1030	24	>9.5; typ. 11	>9.5; typ. 10	>50; typ. 55	see Figs 5 and 6

## List of components (see Fig.4)

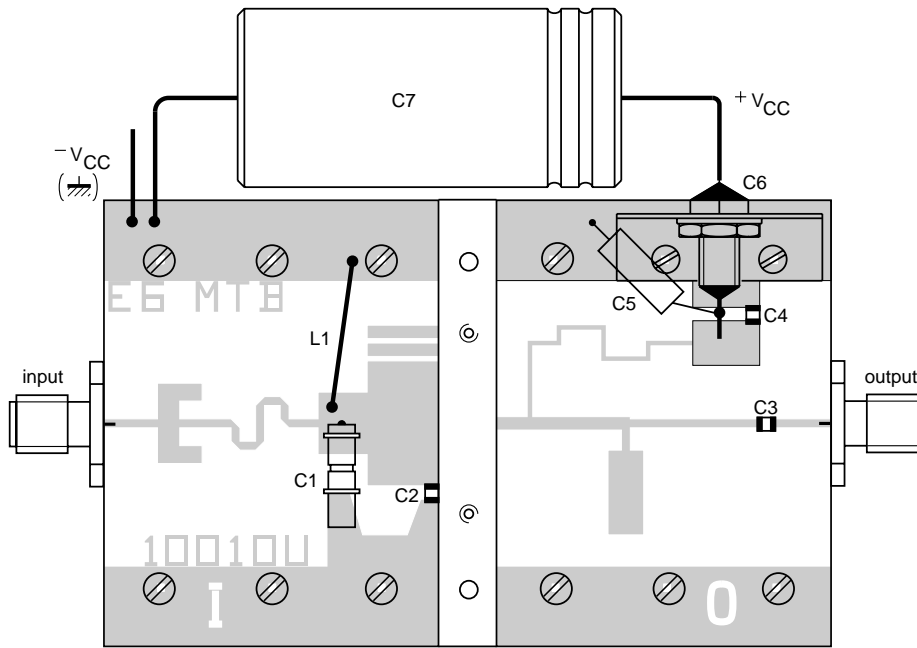
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L1	0.4 mm diameter copper wire	–	rectangular loop	–
C1	tuning capacitor	0.5 – 5 pF	–	Tekelec 5855
C2	chip capacitor	3 pF	–	Eurofarad CEC 23
C3	chip capacitor	10 pF	–	Eurofarad CEC 23
C4	chip capacitor	47 pF	–	Eurofarad CEC 23
C5	tantalum capacitor	10 $\mu\text{F}$ , 50 V	–	–
C6	feedthrough bypass capacitor	–	–	Erie 1250-003
C7	capacitor	220 $\mu\text{F}$ , 63 V	–	–

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MBC785



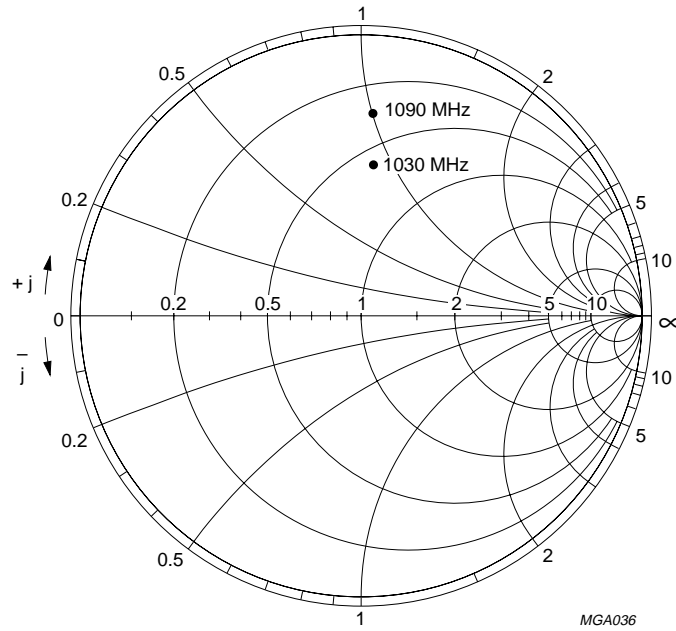
MBC786

Dimensions in mm.  
 Substrate: Duroid 6010.  
 Permittivity:  $\epsilon_r = 10.2$ .

Fig.4 Narrowband test circuit.

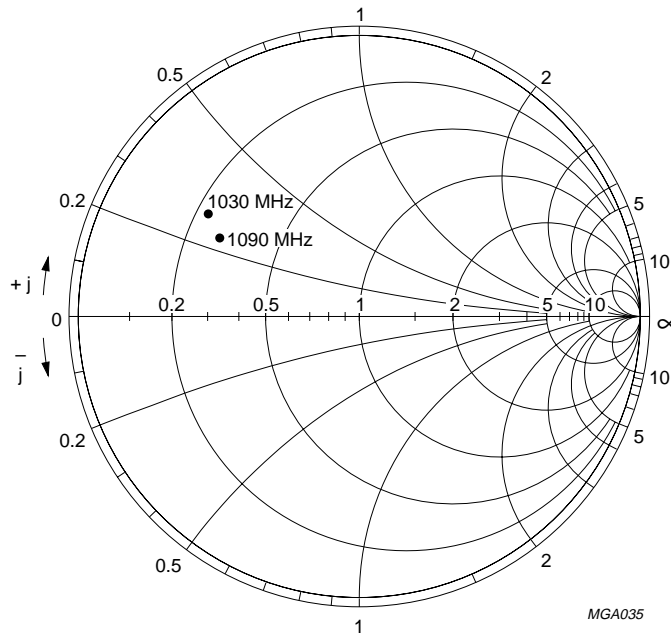
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$V_{CC} = 24 \text{ V}; Z_O = 5 \Omega; P_L = 10 \text{ W}.$

Fig.5 Input impedance as a function of frequency, associated with optimum load impedance.



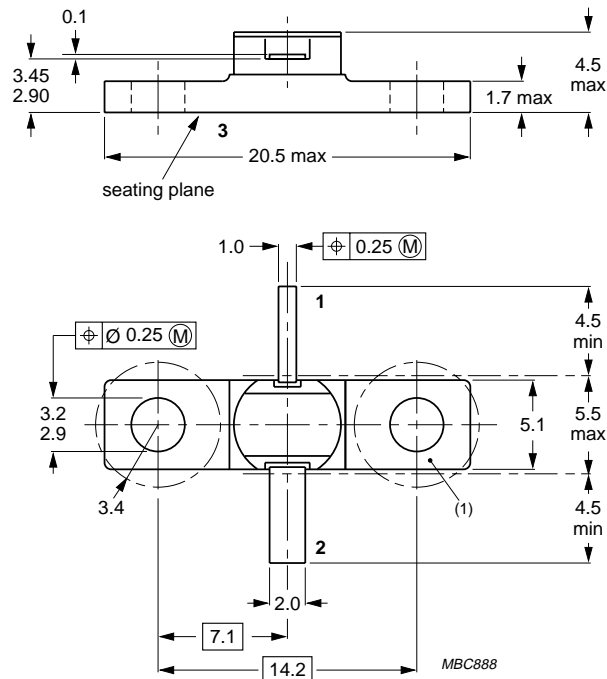
$V_{CC} = 24 \text{ V}; Z_O = 50 \Omega; P_L = 10 \text{ W}.$

Fig.6 Optimum load impedance as a function of frequency; associated with input impedance.

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PACKAGE OUTLINE



Dimensions in mm.  
Torque on screws: max. 0.4 Nm.  
Recommended screw: M2.5.

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 this 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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