

**DISCRETE SEMICONDUCTORS**

# DATA SHEET

## **MX0912B251Y** NPN microwave power transistor

Product specification  
Supersedes data of November 1994

1997 Feb 19

# NPN microwave power transistor

# MX0912B251Y

### FEATURES

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

### APPLICATIONS

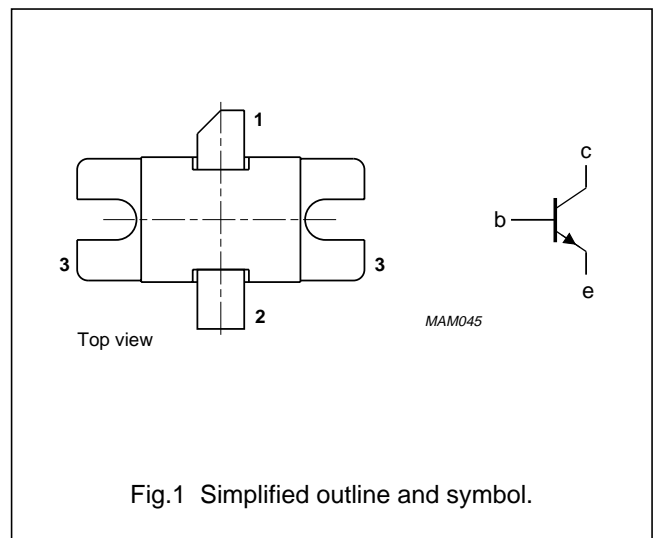
Intended for use in common base class C broadband pulse power amplifier from 960 to 1215 MHz for TACAN application.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT439A metal ceramic flange package, with base connected to flange. It is mounted in common base configuration, and specified in class C.

### PINNING - SOT439A

PIN	DESCRIPTION
1	collector
2	emitter
3	base connected to flange



### QUICK REFERENCE DATA

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

MODE OF OPERATION	f (GHz)	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> = 10 μs; δ = 10%	0.960 to 1.215	50	>235	>7	>42	see Figs 7 and 8

### 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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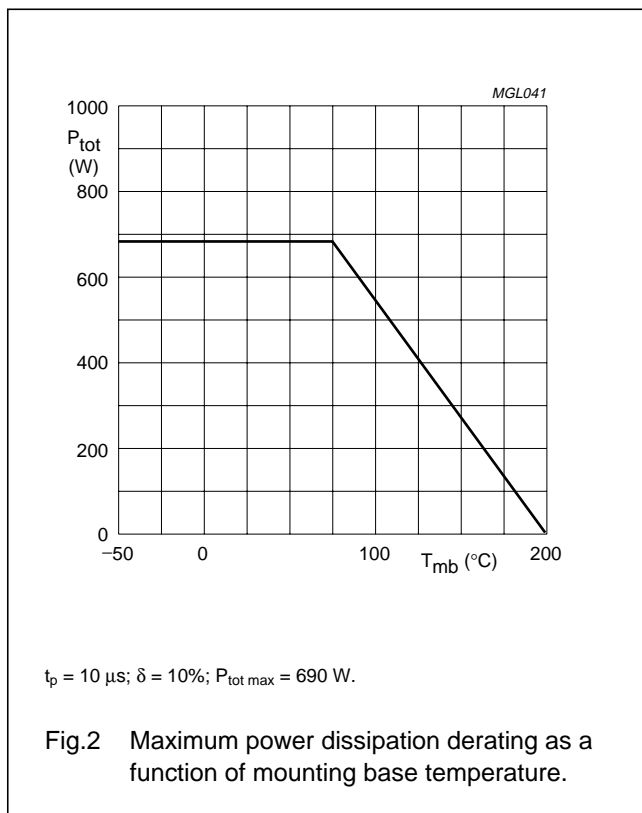
**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	65	V
V <sub>CES</sub>	collector-emitter voltage	R <sub>BE</sub> = 0 Ω	–	60	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	20	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	3	V
I <sub>C</sub>	collector current	t <sub>p</sub> ≤ 10 μs; δ ≤ 10%	–	15	A
P <sub>tot</sub>	total power dissipation (peak power)	T <sub>mb</sub> = 75 °C; t <sub>p</sub> ≤ 10 μs; δ ≤ 10%	–	690	W
T <sub>stg</sub>	storage temperature		–65	+200	°C
T <sub>j</sub>	operating junction temperature		–	200	°C
T <sub>slid</sub>	soldering temperature	t ≤ 10 s; note 1	–	235	°C

**Note**

- Up to 0.2 mm from ceramic.



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**THERMAL CHARACTERISTICS** $T_j = 125\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting base	CW	1.9	K/W
$R_{th\ mb-h}$	thermal resistance from mounting base to heatsink	CW; note 1	0.2	K/W
$Z_{th\ j-h}$	thermal impedance from junction to heatsink	$t_p = 10\ \mu\text{s}$ ; $\delta = 10\%$ notes 1 and 2	0.28	K/W

**Notes**

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

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

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 65\text{ V}$ ; $I_E = 0$	100	mA
		$V_{CB} = 50\text{ V}$ ; $I_E = 0$	10	mA
$I_{CES}$	collector cut-off current	$V_{CE} = 60\text{ V}$ ; $R_{BE} = 0$	100	mA
$I_{EBO}$	emitter cut-off current	$V_{EB} = 1.5\text{ V}$ ; $I_C = 0$	1	mA

**APPLICATION INFORMATION**

Microwave performance up to  $T_{mb} = 25\text{ °C}$  measured in the test jig as shown in Fig.6 and working in class C broadband mode in pulse; note 1.

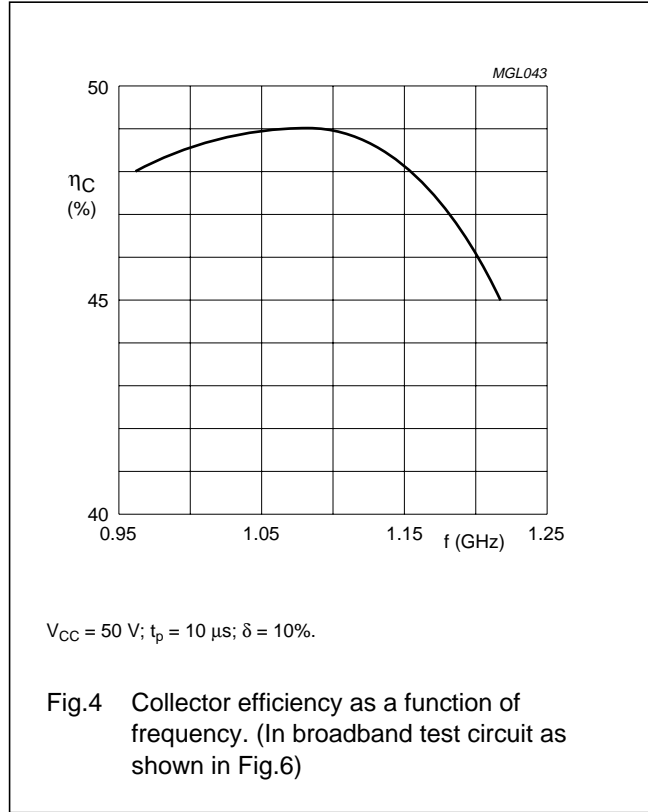
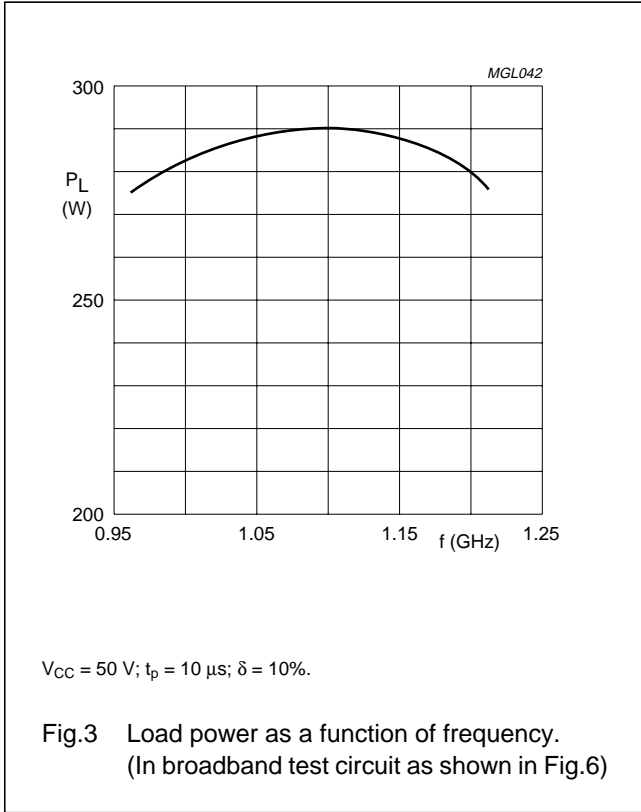
MODE OF OPERATION	f (GHz)	$V_{CC}$ (V) <sup>(2)</sup>	$P_L$ (W)	$G_{po}$ (dB)	$\eta_c$ (%)	$Z_i/Z_L$ ( $\Omega$ )
Class C; $t_p = 10\ \mu\text{s}$ ; $\delta = 10\%$	0.960 to 1.215	50	>235 typ. 275	>7 typ. 7.4	>42 typ. 47	see Figs 7 and 8
$t_p = 300\ \mu\text{s}$ ; $\delta = 10\%$ ; see Fig.5	1.03 to 1.09	50	typ. 280	typ. 8	typ. 48	

**Notes**

1. Operating conditions and performance for other pulse formats can be made available on request.
2.  $V_{CC}$  during pulse.

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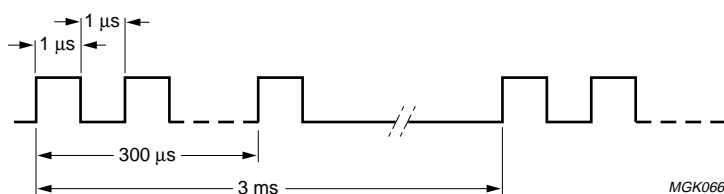


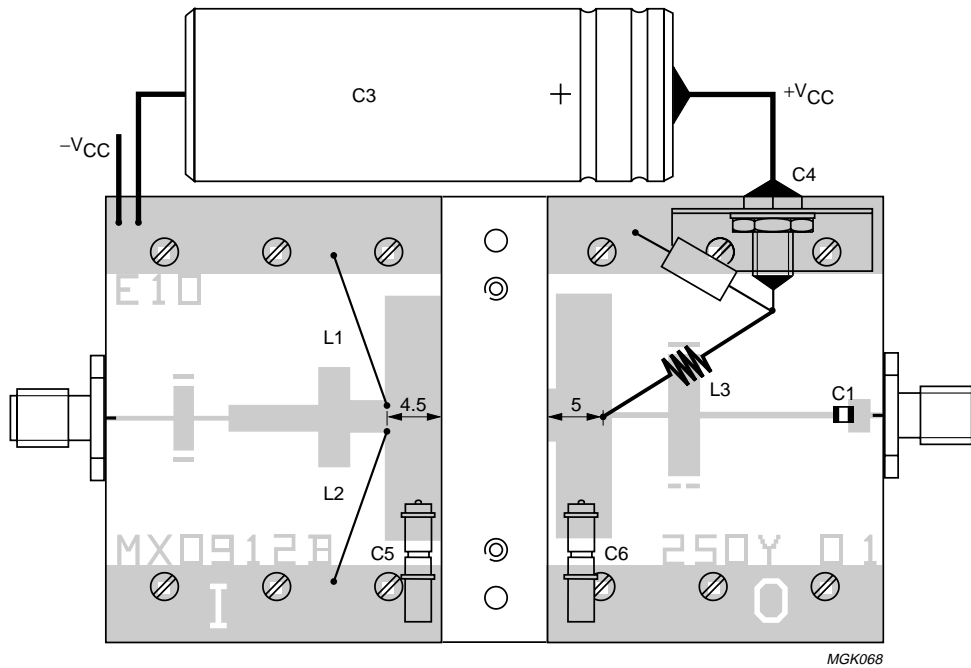
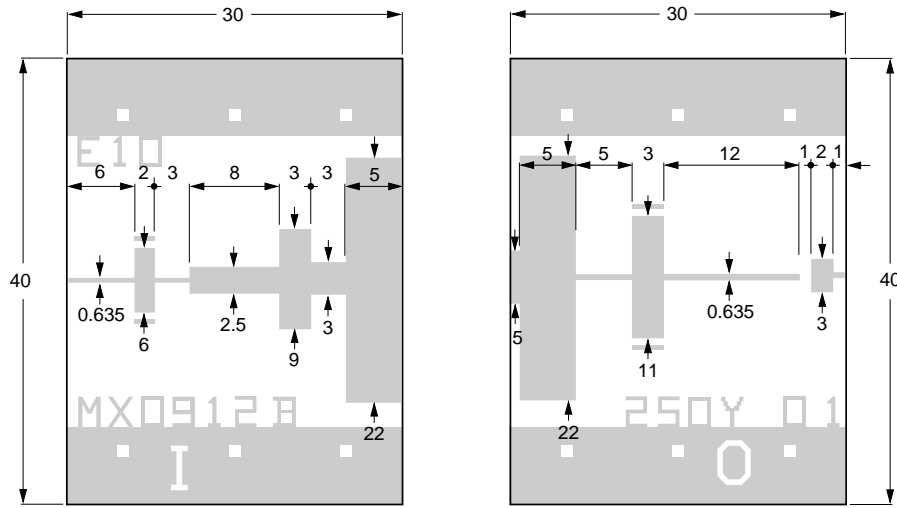
Fig.5 Pulse definition.

## List of components

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L1, L2	0.65 mm diameter copper wire	–	total length = 12 mm; height of loop = 9 mm	–
L3	4 turns 0.65 mm diameter copper wire	–	int. diameter 3 mm; L = 5 mm	–
C1	DC block	100 pF		ATC, ref. 100A101KP50X
C2	tantalum capacitor	10 μF; 50 V		
C3	electrolytic capacitor	470 μF; 63 V		
C4	feedthrough bypass capacitor			Erie, ref. 1250-003
C5, C6	variable gigatrim capacitor	0.8 to 8 pF		Tekelec, ref. 729.1

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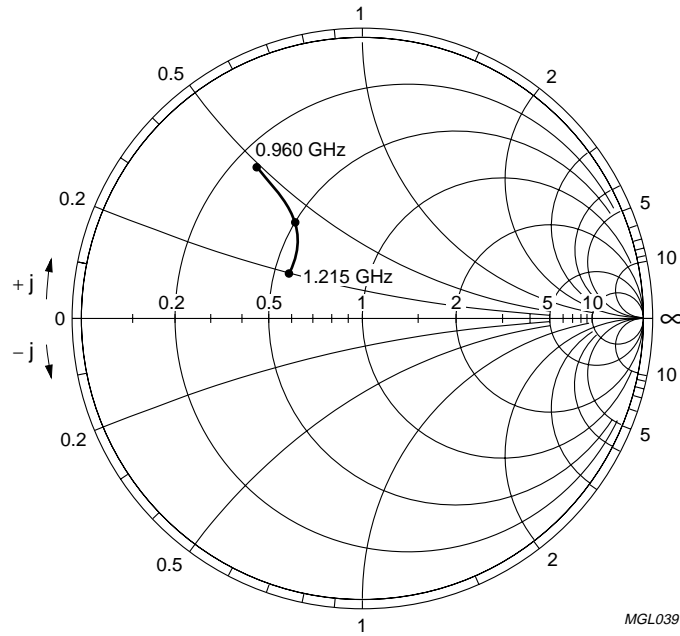
MGK068

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

Fig.6 Broadband test circuit.

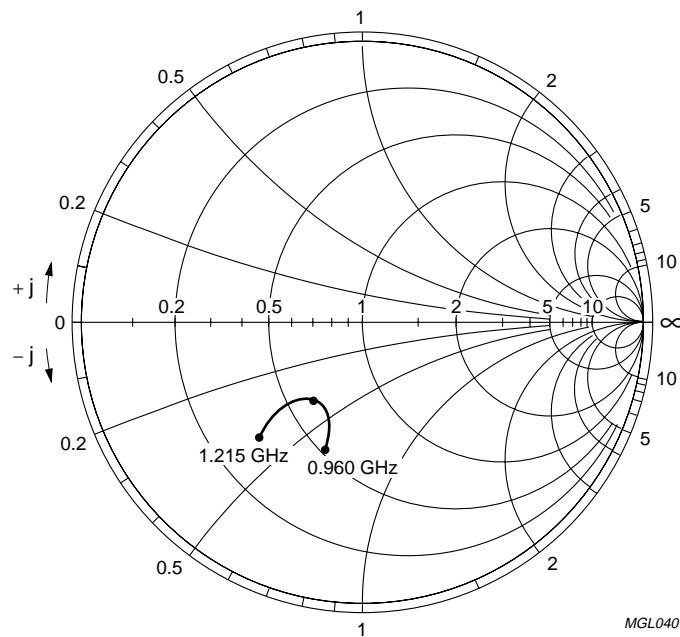
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$V_{CC} = 50 \text{ V}; Z_o = 5 \Omega; P_L = 235 \text{ W}.$

Fig.7 Input impedance as a function of frequency associated with optimum load impedance.



$V_{CC} = 50 \text{ V}; Z_o = 5 \Omega; P_L = 235 \text{ W}.$

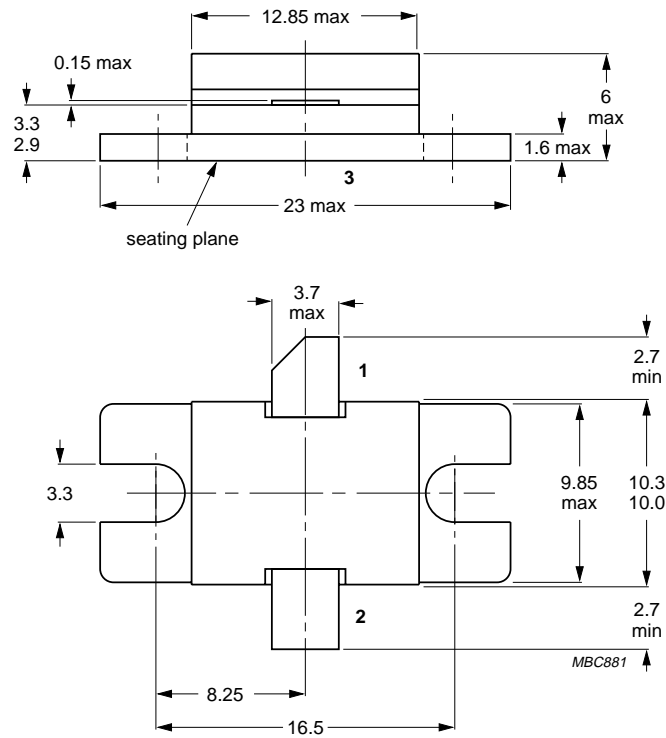
Fig.8 Optimum load impedance as a function of frequency associated with input impedance.



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PACKAGE OUTLINE



Dimensions in mm.  
Torque on screws: max. 0.4 Nm.  
Recommended screw: M3.  
Recommended pitch for mounting screws: 19 mm.

Fig.9 SOT439A.

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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.	

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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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