

# DATA SHEET

**LWE2010S**

**NPN microwave power transistor**

Product specification  
Supersedes data of November 1994  
File under Discrete Semiconductors, SC15

1997 Feb 19

# NPN microwave power transistor

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### FEATURES

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

### APPLICATIONS

Common emitter class A power amplifiers at frequencies up to 2.3 GHz.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT446A metal ceramic flange package, with emitter connected to flange.

### QUICK REFERENCE DATA

Microwave performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in a common emitter class A selective amplifier.

MODE OF OPERATION	f (GHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)	P <sub>L1</sub> (W)	G <sub>po</sub> (dB)	Z <sub>i</sub> /Z <sub>L</sub> (Ω)
class A (CW)	2.3	18	110	≥0.8	≥8	see Figs 6 and 7

### PINNING - SOT446A

PIN	DESCRIPTION
1	collector
2	base
3	emitter connected to flange

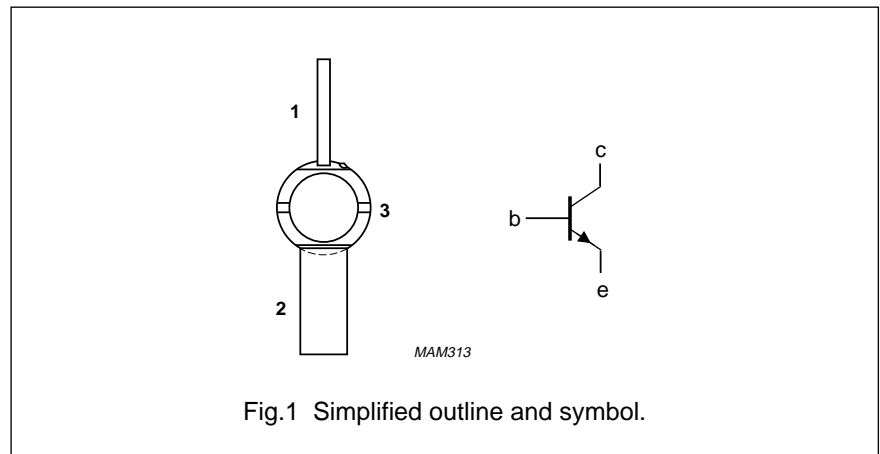


Fig.1 Simplified outline and symbol.

### WARNING

#### Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO 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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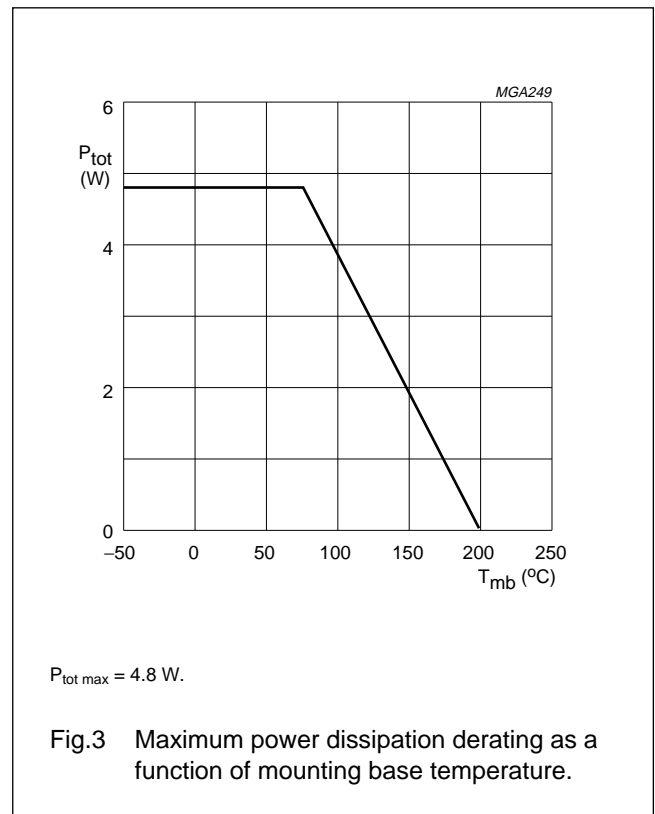
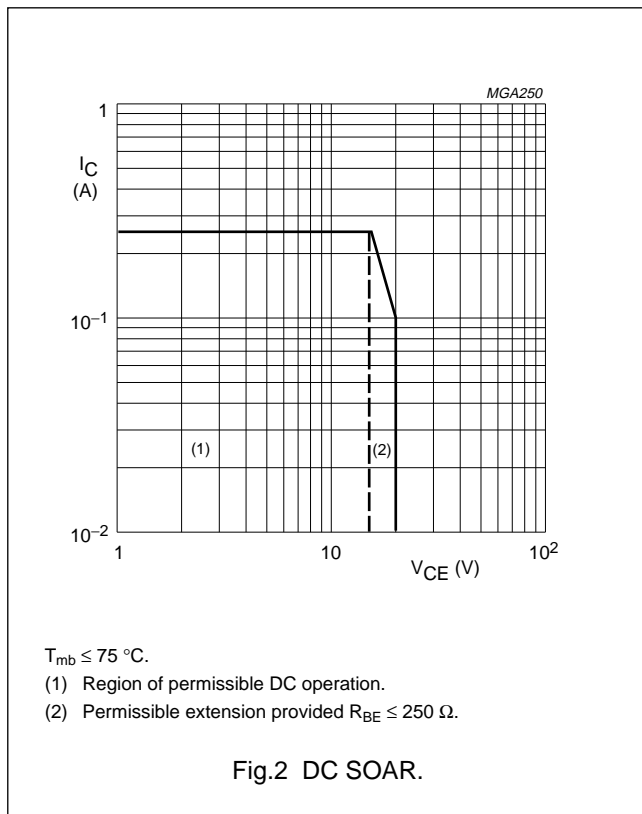
**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	40	V
V <sub>CER</sub>	collector-emitter voltage	R <sub>BE</sub> = 250 Ω	–	20	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	15	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	3	V
I <sub>C</sub>	collector current (DC)		–	250	mA
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 75 °C	–	4.8	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 0.1 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	2	K/W

## Note

- See "Mounting recommendations in the General part of handbook SC15".

## CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 20\ \text{V}; I_E = 0$	–	75	$\mu\text{A}$
		$V_{CB} = 40\ \text{V}; I_E = 0$	–	500	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current	$V_{EB} = 1.5\ \text{V}; I_C = 0$	–	200	nA
$h_{FE}$	DC current gain	$V_{CE} = 5\ \text{V}; I_C = 110\ \text{mA}$	15	150	

## APPLICATION INFORMATION

Microwave performance up to  $T_{mb} = 25\ ^\circ\text{C}$  in a common emitter class A selective amplifier.

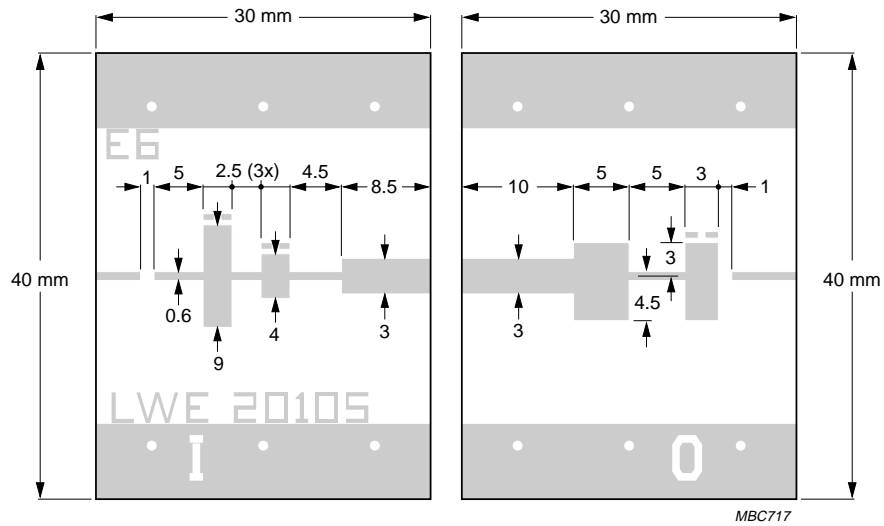
MODE OF OPERATION	f (GHz)	$V_{CE}$ (V)	$I_C$ (mA)	$P_{L1}$ (W)	$G_{po}$ (dB)	$Z_1$ ( $\Omega$ )	$Z_L$ ( $\Omega$ )
Class A (CW); note 1	2.3	18	110	$\geq 0.8$ ; typ. 0.9	$\geq 8$ ; typ. 9	$5.2 + j\ 16.5$	$7.5 + j\ 8.75$

## Note

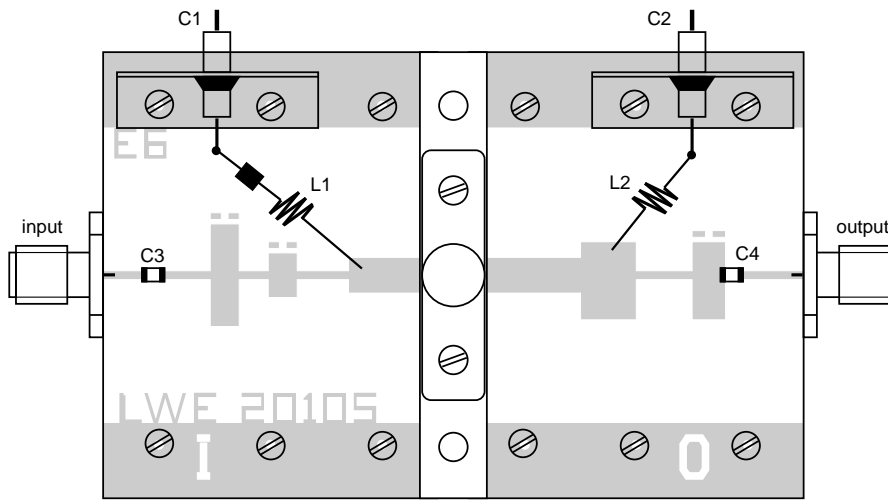
- In narrowband test circuit shown in Fig.4.

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MBC717



MBC718

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

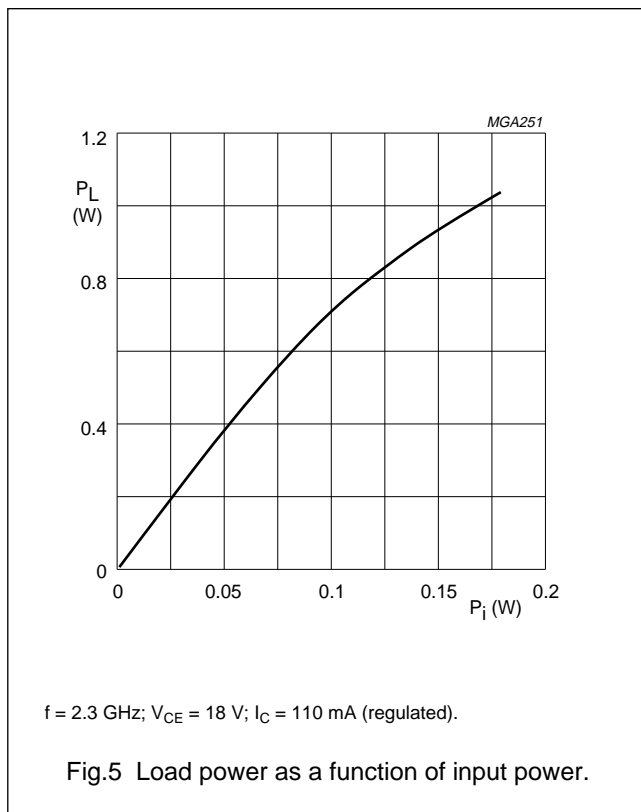
Fig.4 Prematching test circuit board.

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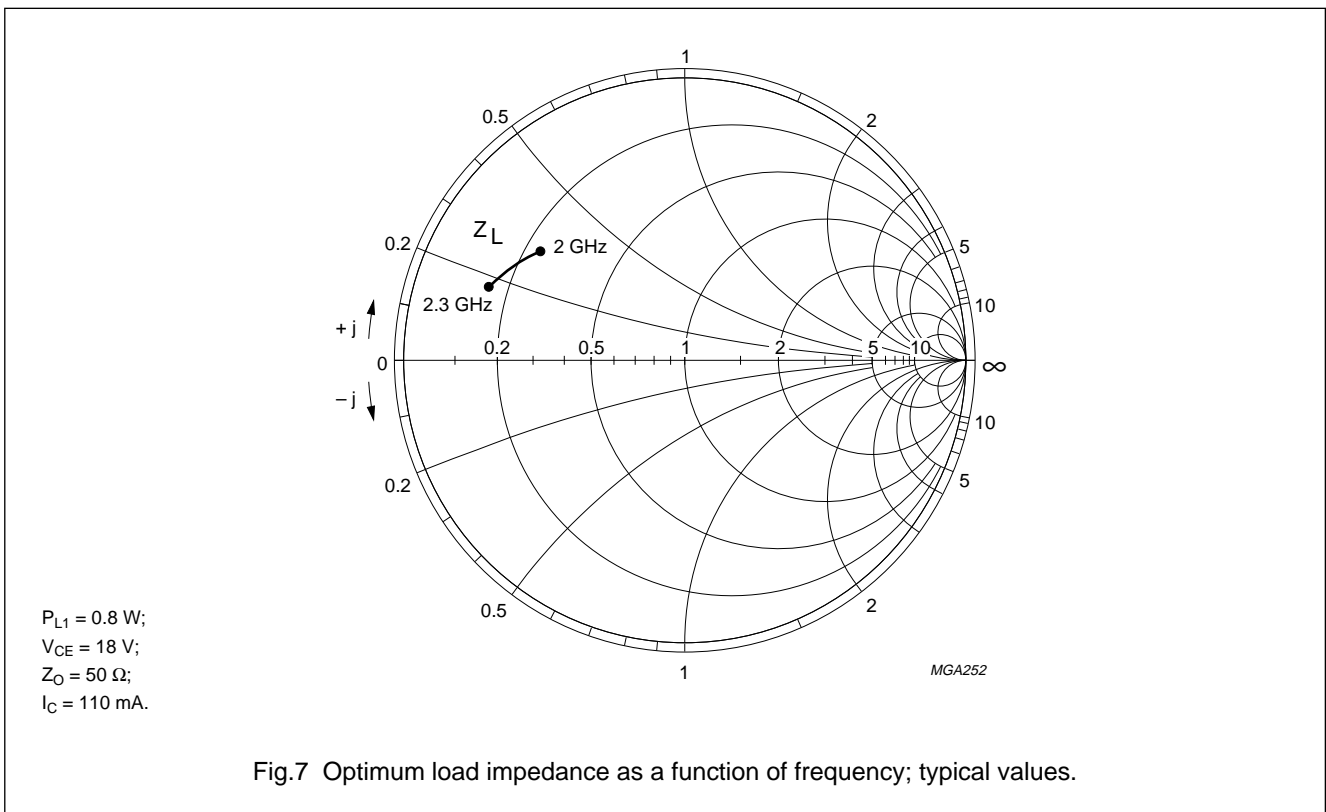
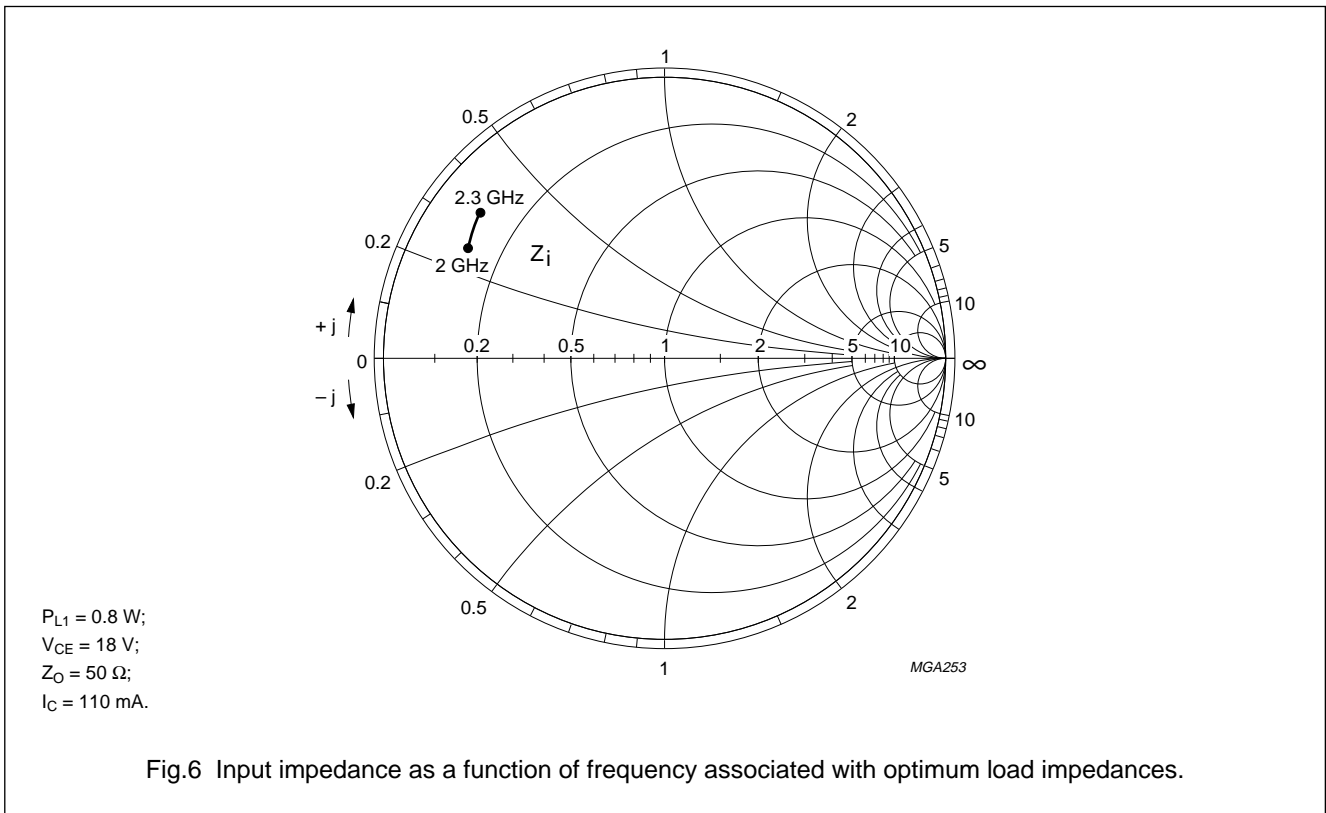
List of components (see Fig.4)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L1	3 turns 0.2 mm copper wire with ferrite bead		int. dia. 2 mm	
L2	5 turns 0.5 mm copper wire		int. dia. 2 mm	
C1, C2	feedthrough bypass capacitor			Erie, ref. 1214-001
C3, C4	DC block capacitor	100 pF		



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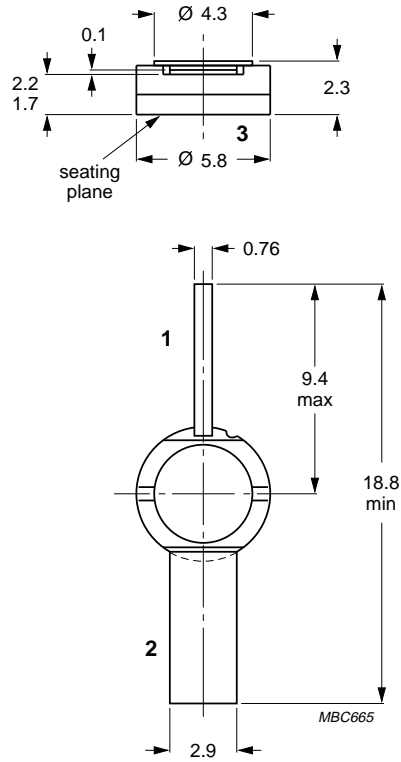
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PACKAGE OUTLINE



Dimensions in mm.

Fig.8 SOT446A.



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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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